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THE matter of keeping permanent records of side tracks has not generally been given as serious attention by the different railways as it deserves. Many of them have few, if any, records of these tracks; often the only reliable information available is that in the possession of the roadmaster or section foreman under whose supervision the tracks were built. It is constantly becoming more necessary to have complete and accurate data at hand as to their location, length and ownership, to meet the demands of the various state and national commissions for information concerning the physical conditions of the properties. Such information is also of assistance in making plans for improvements, the question of the length of existing tracks and the weight of their rails often arising when any change or addition is contemplated. The greatest value of a complete record probably consists in its usefulness in settling the question of the ownership and maintenance of industry tracks, which so often leads to disagreements and disputes. In many cases these tracks are owned in part, or entirely, by private concerns, and are maintained by the railway at their expense. In such cases the point of division of ownership is of great importance. The officers in charge of the maintenance of side tracks should have complete information at hand concerning their ownership, and not have to search through files of correspondence or contracts, if the latter exist. Frequently where tracks have been in use for many years all definite records of ownership are lost; and when a disagreement arises it is difficult to find a basis for settlement. One railway, which serves numerous industries in an important section of a large terminal city, had so many controversies arising from this cause that its officials, unable to find authentic records of ownership, were forced, in order to settle the matter, to make arbitrary divisions of ownership with the various industries. Each year's delay in compiling such information renders it increasingly difficult to get at the exact facts. When once compiled the records should be carefully revised at regular intervals to keep them up to date, and entries should be made for all new tracks at the time they are built. After having studied this subject the Committee on Records and Accounts of the American Railway Engineering Association for the past year rendered a valuable service by calling attention to the necessity of collecting the necessary information and submitting a form for keeping it.

THE increases a number of roads are making in the rates of pay of section and extra gang foremen is a step towards increasing the efficiency of track forces. The inefficiency of the foremen is the cause of a large part of the unnecessary cost of track maintenance, and by increasing his pay the greatest improvement can be secured for a given increase in expenditure. It sometimes happens that when sending out for track labor a road will offer five or ten cents a day more than the prevailing wage, believing that in this way it will secure a better class of labor. This is not, and will not be, the result as long as the wage paid by the railways remains as far below that paid for unskilled labor in other industries as it is now. No increase short of that which will place the wages paid by the railway on a par with those of other industries will draw a new and improved supply of labor into this market. On the other hand, a small increase in the foremen's wages is money well spent, for the ratio of efficiency secured from a gang of men depends directly upon that possessed by the foreman. An able foreman will secure better results from poor men than an inefficient foreman will from good men. The necessity of having a high-class of foremen has long been realized, but the wages offered have not been adequate, and as a result the general standard has gradually declined. There is today a necessity for a higher grade of foremen than ever before, because of the continually declining quality of the labor, and also because of the continually higher standards demanded in track maintenance. It requires a man of no mean ability to get the best results from a gang of fifty men engaged in the simpler forms of track work, to say nothing of the more complicated frog and crossing work; for knowledge of the work as well as ability to handle men is required. Again, the question of providing for the future supply of foremen must be considered. To a very large degree these men should be recruited from outside the ranks of present track labor, and in order that this may be done some inducement must be offered sufficient to attract competent men from other fields. The track apprentice system was tried on several roads with varying degrees of success. The plan was correct in theory, but failed on its practical side—that of offering sufficient financial reward. It is desirable to attract bright young men, technically trained, if possible, into track work, but greater financial inducements must be offered if they are to be secured. The average salary paid foremen at present does not appeal to such a class of young men as something toward which to work.

NEW YORK CENTRAL-NEW HAVEN AFFILIATION IN NEW ENGLAND.

WE have noted briefly heretofore facts and symptoms pointing to the closer affiliation in New England of the New York, New Haven & Hartford, and the New York Central interests. Such indications as the joint control of the Rutland and the transfer of three heavy and profitable express trains from the New London route to the Boston & Albany route via Springfield to northern New England were not to be overlooked, as well as minor changes of traffic to the Boston & Albany, and plans for closer interchange of traffic on the Boston & Albany subsidiary lines. To these steps is now added a much longer stride in the same direction. The lease balance over operation and fixed charges of the Boston & Albany carried by the New York Central as lessee for nearly a decade is to be shared by the New York Central jointly with the New Haven on even terms, half and half. Whether deficit or surplus the two companies will divide it; and, though the New York Central will operate the leased road the implication is strong that the New Haven will also share on even terms in the Boston & Albany directive influence and policy. The two railway corporations, already holding common terminals at New York and Boston have now in the Rutland and the Boston & Albany what may be called a large intermediate community of interests. Terminal interests of the two are expanded to the railway territory between them and northward.

The financial results for the two corporations are interesting, but also somewhat speculative. The purchase of Rutland stock not now paying dividends, by the New Haven, is credibly reported to have cost $2,500,000. At the low rate of 4 per cent., this is an annual interest charge of $100,000. During the last seven years the deficit on the Boston & Albany has averaged $660,307 yearly. It has ranged from a surplus of $310,803 in 1905-6, to a deficit of $1,927,837 in 1907-8, and last year it was $578,337. It is understood, however, to be roughly estimated, now and under existing conditions, by officers of the two companies, at about $900,000, half of which, or $450,000, the New Haven assumes. On that basis putting the Rutland and Boston & Albany deals together, the New Haven assumes a fixed charge of $550,000, and the New York Central is relieved practically of the same burden.

This is the present financial aspect of the bargain. How far by the new transfer of traffic, by economies of joint operation and interests, by shippings of through business, will the Boston & Albany load be lightened—and that without loss to the New Haven in other directions? The answer must obviously be deferred until the returns for the fiscal year 1912. But the gains will, doubtless, be considerable. As one clue it is stated that the transfer of the three express trains to the Boston & Albany, to better roadbeds, to a shorter route and with much shorter time, will profit, net, the New Haven more than its present long haul of those trains. General business conditions, however, complicate any estimates, and in any particular year may prove a greater element in the traffic returns than any new phases of operation.

But the primary object of President Mellen in accepting a plan that, on its face, is a large new financial charge, is stategic and based on the long look ahead. Absorption of New England railway territory as completely as possible is the key to his campaign. That policy has become the more imperative now that the Grand Trunk is threatening an invasion at its center. With that menace the Boston & Albany assumed new import. It might, potentially, piercing New England at its heart and reaching to Boston become a base line of Grand Trunk exploitation, holding not merely terminal rights at New England's capital, but with radiating branch line possibilities affecting other centers of industry. With the New Haven sphere of influence extended to the Boston & Albany, that peril, while not extinct, is thrust further into the background. In that connection, as a part of the strategy against the Grand Trunk, attention should be called to the outlet to Montreal and into Grand Trunk territory secured by the New Haven in the Rutland purchase; also, on a smaller scale, there is the purchase of the Montpelier & Wells River, heretofore a feeder of the Grand Trunk.

In this conflict with the Grand Trunk, which so clearly underlies the New Haven's policy, the close relations of the New Haven with the Canadian Pacific must not be underrated. That the New York Central, so far as concerns its New England business, will be drawn into harmony with the Canadian Pacific, is a fair inference. From the new affiliations of the New Haven. A broader view of those affiliations is suggested by the query as to where the natural and territorial kinship of the New Haven and the New York Central is to stop. On that point forecast would be more clear were the traffic relations of the New Haven and the Pennsylvania less intimate and important to both.

Sharp historical reminders go with the partial fulfillment of the New Haven's old ambition for control of the Boston & Albany. Eighteen years ago President C. P. Clark, of the New Haven, opened a policy of rapid railway absorption which, at the time, well nigh dazed its old fashioned and ultra-conservative directorate. He took in the New York, Providence & Boston, with its double boat lines and its leased Providence & Worcester; he leased the Old Colony, with its maze of Massachusetts roads, its prosperous boat line and its leased Boston & Providence, giving the New Haven its own through line to Boston; and he reached out boldly into Boston & Maine territory, and all but acquired the Connecticut River road—a project only thwarted by the purchase by the Boston & Maine interest of the Connecticut River majority shares at a great price. There followed the "Partition of Poland," by which the Boston & Maine agreed with the New Haven to divide territory, making the Boston & Albany the separating line. A few years of President Mellen's aggressive policy now finds a dramatic change from the railway map of New England, as it was then. The New Haven holds not only the whole railway system of the party of the second part in the historic partition, but has firm and probably permanent lodgment in the division itself.

THE GENERAL ELECTRIC COMPANY.

THE record of business done by the General Electric last year is an impressive illustration of the growth and development of industries using electric power. Descriptions of installation of new hydro-electric plants in different parts of the country from Oregon to North Carolina are so common that one is apt to overlook the significance and magnitude of this new development. The total sales of the General Electric for the year ended December 31, 1910, amounted to $71,478,558, while the cost of sales, including $4,661,175, depreciation of plant, amounted to $63,134,602, and the profit for the year was $10,855,692. In the 11 months ended December 31, 1909, total sales amounted to $51,656,632, and profits to $6,493,671. During that 11 months $2,447,984 was charged for depreciation.

In the report for 1910 of the vice-president in charge of the engineering department of the General Electric, special mention is made of the success of the company's engineers in the solution of problems arising from the utilization of water power, which in many cases requires the transmission of electric power over long distances, and which can be accomplished economically only by the use of high potential currents. The company is now manufacturing turbines and electric generators of 20,000 k. w. and transformers of 14,000 k. w. capacity. Mention is also made of the improvement in high tension direct current railway apparatus, which the General Electric has made a specialty of.

The report of the vice-president in charge of sales and orders shows that last year total sales billed amounted to $71,478,558, and total orders received amounted to $71,182,391, both the sales billed and orders received being the largest for any year in the history of the company. The orders received were 17.7 per cent. greater than the orders received in 1907, the largest year heretofore reported. The increased business last year came largely from regular customers in small contracts and current orders,

rather than from new enterprises requiring larger amounts of electric apparatus. Unfilled orders as of December 31, 1910, amounted to $15,500,000 and as of December 31, 1909, amounted to $15,600,000.

The annual report of the General Electric Co. is a model of thoroughly sound accounting. In the explanation of the various items that go to make up the balance sheet, especially the General Electric is specific in its statements and sound in its theory of accounting for industrial incorporations. During the 18 years to December 31, 1910, the company spent for land, buildings and equipment $42,142,255, and charged off to profit and loss for depreciation $30,584,469, leaving the book value of an investment of $46,100,783 ($3,958,528 original value in 1893) as $15,516,314. This is a valuation of but $1.82 per sq. ft. of floor space owned by the company including land buildings, machinery and other equipment. Notwithstanding these charges to profit and loss the company showed a total surplus at the end of 1910 of $23,022,706 Cash on hand at the end of 1910 amounted to $14,912,400 and total current liabilities to $4,602,712. Notes and accounts receivable totaled $19,047,459 at the end of last year, as against $19,377,972 at the end of the previous year, while merchandise inventories, which are figured on a conservative basis, totaled $28,059,941 last year, and $25,150,036 the year before.

The General Electric Co. has outstanding $65,179,600 stock and $14,962,000 debentures. It pays 8 per cent. dividends on the stock, and in 1910 had a surplus for the year of $10,855,692 after a payment of $5,214,368 in dividends.

NEW BOOKS.

Track Formulae and Tables. By Shelby Saufley Roberts, C. E., Mem. Am. Soc. C. E.; Mem. Am. Ry. Eng. and M. of W. Assoc. 514 pages, 4 in. x 7 in. John Wiley & Sons, New York.

The purpose of the book, as explained by the author, "is to present in a practical manner those track problems most frequently met in actual practice, supplemented by time-saving tables in connection therewith and other tables of assistance in estimating." It is chiefly devoted to algebraic solution of problems of track layouts, and includes the various tables of logarithms and functions of angles, as well as other tables involving short cuts in the solution of track problems. The book shows clearly typical methods of computations of data from which track work may be laid out in the field. Simple turnouts from straight and curved tracks, slips, three-throw switches, crossovers, yard leads and layouts are included. To make the methods clear many problems are worked out thoroughly, and their study should be of value to men engaged in such work. All this is well done and well expressed and shows the author's thorough familiarity with his subject. A study of the book would certainly be of advantage to students whether they are in the class room or engaged in active practice.

One cannot criticize the work that went into the making of this book, but one can have some doubt of the great value of any book which is intermediate in size and scope between the small collection of the tables required for actual field work and the larger treatises giving more broadly the mathematics and methods of solving these problems. Each one of us engaged in track layouts has to develop for himself concise methods of doing the particular work that is before him, and if he is thoroughly grounded in the mathematics and has any common sense and some executive ability will find these short cuts very soon and be able to judge just what accuracy is justified. It is hard for anyone to study a number of specific cases in which he is not vitally interested and learn the exact way that that particular piece of work was done. Such study lacks the incentive which the broader text books used in a class room have of showing a solution which may be applied to any subject; and it lacks the inspiration which the desire of getting results inspires in a good man who has been assigned a definite work.

To sum up, the work represented by this book is well done. It is of limited scope. It is too heavy and voluminous to be convenient for a man to carry in the field. It does not involve enough mathematics to cover all of the principles of track layouts. E. L. T.

The Elements of Graphic Statics and of General Graphic Methods. By William Ledyard Cathcart and J. Irvin Chaffee. Cloth, 312 pages, 59 illustrations, 6 in. x 9 in. Published by D. Van Nostrand Co., 23 Murray street, New York. 1910. Price, $2.

Graphic methods are usually applied in the analysis of stresses in stationary structures, and a majority of the text books on the subject have been written for civil engineers, but this treatise is intended also for students in mechanical and marine engineering and as a possible service to engineers in those professions. The book provides a review of the principles of graphics and their application to framed structures and mechanism. The text is fully illustrated by diagrams, and the principles of applied mechanics and of the strength of materials are discussed where necessary. The methods of Hermann, Cremona and Reuleaux have been freely used and are properly acknowledged. The treatise covers much that is usually found in the text books on mechanics, but the treatment of graphics is fuller, has a greater variety and is more complete. The portion relating to graphics of forces occupies two long chapters, and that on beams and trusses four chapters, while that relating more particularly to machinery is dealt with under the graphics of friction and moment diagrams for shafting. The volume should prove a useful text book for courses in mechanics, as the graphical methods are more direct and simpler than a mathematical analysis and further extension of such methods would seem desirable. For a standard text book of this size, considering the quality of the paper and illustrations, the price is unusually low.

Proceedings of the Thirteenth Annual Meeting of the American Society for Testing Materials. Atlantic City, June, 1910. Volume 10. Cloth, 6 in. x 9 in., 671 pages. Office of the secretary, University of Pennsylvania, Philadelphia, Pa.

The work of the Society for Testing Materials increases in volume and importance from year to year, and the proceedings for 1910 contain such a large number of papers and discussions that it is difficult to indicate their variety and scope without giving the whole table of contents, which covers three pages of the volume. Many of these papers are of special interest to those in charge of railway physical and chemical laboratories, and the society has become the medium, or exponent, for the publication of the more important work of these laboratories. The former president of the society, Dr. Charles B. Dudley, was the first to organize a chemical laboratory for railways, and his work for the Pennsylvania Railroad at Altoona covered a period of 35 years. The addresses delivered at the Dudley memorial session at Atlantic City are contained in this volume, beginning with one by Theodore N. Ely on Dr. Dudley as a railway man, and ending with a personal tribute by R. W. Hunt. A special memorial volume commemorative of Dr. Dudley's life and his life work is now in course of preparation and will soon be available for distribution.

Among the principal papers included in this volume which are of special interest to railways are the following: The group relating to standard specifications for iron and steel; those on corrosion of iron and steel, including the painting of steel test panels at Atlantic City; those on preservative coatings for structural material, including the inspection of the Havre de Grace bridge; those on linseed oil and the influence of pigments on corrosion; and the report of the committee on varnish. Standard specifications for yellow pine bridge and trestle timbers; waterproofing materials. The influences of titanium on segregation of bessemer steel rails; low carbon streaks and open hearth rails; elongation and ductility of rail sections under drop testing. Unevenly chilled and untrue car wheels. A group of papers relating to reinforced concrete, cement and bituminous materials. The scleroscope; with a general discussion on hardness; apparatus for microscopic examination of metals. The volume is well printed and illustrated, and has both a subject index and an author's index.

Letters to the Editor.

THE EFFICIENCY OF RAILWAY EQUIPMENT.

Chicago, April 12, 1911.

To the Editor of the Railway Age Gazette:

The editorial on The Efficiency of Railway Equipment, in your issue of April 7, 1911, is quite timely. It not only points out a serious defect in locomotive and car performance statistics, but by the use of such statistics as are available it demonstrates quite clearly the failure of the railways to secure the benefit of, or the public to avail itself of, the additional locomotive and car capacity provided during the past seven years.

When one attempts to analyze transportation results with a view to locating and correcting some item of unsatisfactory performance, the incompetency of many so-called "units" is obvious. An attempt, for instance, to measure locomotive efficiency by a year-to-year comparison of tons per locomotive mile is very unsatisfactory, as that unit takes no account of the increase in size and power of locomotives. A comparison of ton miles handled per tractive unit is equally unsatisfactory, since it injects the factor of traffic density. A comparison between increased tons per locomotive mile and the increase in average tractive power would be more illuminating, but, unfortunately, an accurate comparison of this sort is prevented by the failure of the tractive statistics to make a separation between freight and passenger locomotives. In the case of cars, we have a little better record than we have for engines, in that the performance of freight cars is shown separately from passenger cars. We also have some fairly reliable data on the number of cars idle at various times. Added to this, there are figures showing cars idle on "account of being in bad order," percentage of movement without load, and the average lading per car.

Both locomotive and car statistics, however, are open to at least one common objection; i. e., their failure to take into consideration the hours of service. If all cars and all engines were fully employed during each hour of every day in the year, the averages, "ton miles per engine," "miles per car per day," and "ton miles per car per day," when compared with increased locomotive power and additional car capacity, would prove rather accurate measures of the degree of efficiency secured. As things are the units available are not only unsatisfactory measures, but to the extent that they do reveal a lack of general efficiency they do not permit of a definite location of responsibility.

Statistics are in the nature of post-mortem data, and their chief value lies in their applicability to future performance. It avails little that we are informed of a decrease in the tons handled per car unless the information indicates the cause. With the exception of possibly one common item, there is a marked difference in the kind of statistics required for locomotive and car performance. I shall pass over the question of locomotive statistics by referring to the excellent formulae prepared by the Committee on Conducting Freight Transportation of the Association of Transportation & Car Accounting Officers, submitted at the June, 1909, meeting of that Association. These formulae provide a scientific method for handling power. They take into account tractive power, gradient, speed of train, temperature, in fact every item entering into the transportation problem, and even provide for an accurate determination of the advisability of running light trains, or holding power for tonnage, by reducing to dollars and cents the value of an increase in miles per car per day.

Now, as regards car performance. Up to within a few years ago, the "average miles per car per day," was the accepted unit. With the advent of the Car Efficiency Committee of the American Railway Association in the winter of 1906-7, and the inauguration of their statistical compilations, this unit, while still maintained as a valuable measure of car movement, was supplemented by the introduction of a new unit—"ton miles per car per day." This figure combines the various factors of car loading, loaded haul, daily movement, time idle on account of bad order or light traffic, and represents the net daily productive performance of all freight cars, reduced to an average for each car in existence. It is admitted that this unit does not furnish a fair basis for comparison between different roads, and it is probable that no unit will ever be discovered that will serve that purpose, since it is obvious that no two roads operate under precisely similar conditions. As a combination unit, however, backed by the averages of the various factors that influence it, the "ton miles per car per day" was a valuable addition to transportation statistics. It is clear, however, that even for the individual road this unit falls short of providing a "statistics" that will measure the percentage of potential efficiency obtained. The difficulty is not with the unit itself, as it is complete so far as it goes, but it fails as a measure merely because a standard is lacking. We do not yet know what 100 per cent. efficiency of freight car is.

In the matter of capacity, we know that a 20-ton load in a 50-ton car is 40 per cent. loading efficiency, and that an empty movement of 30 miles each 100 traveled is 70 per cent. efficiency in loaded haul We cannot, however, say even approximately what percentage of efficiency is obtained in a movement of say 25 miles per car per day. Among the factors entering into that average are items of all kinds, such as idle time spent on storage tracks by reason of light demand for equipment; delays by shippers or consignees; time held out en route by traffic congestion, and time spent in shops for repairs. It is apparent, therefore, that unless we have a figure representing the ideal or highest possible performance of a car, we can not judge from the actual performance what per cent. of efficiency is reached. Furthermore, unless both the ideal and the actual performance retain measures of the individual factors entering into car performance, the results will not be adequate as a check on car efficiency. Under present conditions, 10 miles per hour is accepted as standard for freight train movement. Applying this schedule to a 50-ton car, the maximum possible daily efficiency would be represented by 10 miles $\times$ 24 hours $\times$ 50 tons $=$ 24,000 ton miles per car per day. This is of course a purely ideal standard. In practice it is subject to reduction by—

(a) Time idle on account of insufficient traffic.
(b) Detention by shippers and consignees loading or unloading.
(c) Detentions en route from various causes.
(d) Time undergoing repairs.
(e) Empty movement to point of next loading.
(f) Loading light of car capacity.

Many of these factors are under the control of the transportation officer, and all of them are susceptible of analysis with a view to correction or improvement. The following crude example will give an idea as to how this analysis may be made:

Month of ....., 19....

Total cars owned 1
Average capacity ..... 50 tons
Total capacity ..... 50 tons
100% efficiency.....50 $\times$ 10 $\times$ 24 = 12,000 ton miles per day

Reduction account of		Amount of Reduction.	% Utilized.
Light loading of car.....		25 tons	50
Time in shop.....	05%		
Time idle, account surplus..	10%		
		15%	85
Empty movement		30%	70
Detention—			
R. R. yards, terminals, and en route	35%		
Shippers—consignees	35%		
		70%	30

50 $\times$ 85 $\times$ 70 $\times$ 30 = 8.75%
12,000 $\times$ .0875 = 1,070 ton miles.

The ton miles arrived at by this analysis could be checked against the averages secured from the regular tonnage statistics, and if serious discrepancies were developed the analysis could be corrected until it provided an accurate statement of the efficiency in the various items. The calculation of such items as yard and road detention is no more impracticable than the calculations of the tons per car; the percentage of empty movement; the shop percentage, or other items that are standard statistics on the majority of roads. The general adoption of some system like the above for working out the percentage of maximum efficiency for each individual road would go a long way toward

locating the responsibility for failure to utilize increased capacity, and would as a natural result lead to a correction of the trouble.

O. C. CASTLE.

THE ARBITRATION OF LABOR DISPUTES.

Peoria, Ill., April 14, 1911.

To the Editor of the Railway Age Gazette:

President Delano's letter in your issue of April 7, is not only interesting to railway employees, but will receive their careful thought because of his past fair attitude to employees.

The Erdman act provides for the optional arbitration of railway labor disputes. If it is proposed that arbitration should now be made compulsory instead of optional, such a law would probably be found unconstitutional if it included provisions for the enforcement of an award that compelled one man unwillingly to labor for another.

I know of no proposition which would be so distasteful to working people in any class of employment as *compulsory* arbitration, even though it could legally be enforced. Without assuming the role of a ghoul and digging from history's graveyard the skeletons of workingmen a century old, it can readily be shown that when the courts dictated the wages and working conditions of the working people they enjoyed but little greater privileges than those of serfs. The distinction between judgments of the courts and awards resulting from compulsory arbitration is not sufficiently clear to convince the working people that they should trust their future welfare, and the welfare of coming generations of working people, to what we have been taught to call "blind justice."

The Erdman act, as originally approved, by the President, prevented the dismissal of employees because of their membership in labor unions. A labor union is almost essential to carrying out the machinery of the act; but the United States Supreme Court subsequently held that this portion of the act was unconstitutional. Provide any form of arbitration which denies the right to working people to quit the service of their employer, and the same United States Supreme Court would probably find that clause unconstitutional. This would suggest the idea that the framers of the constitution did not anticipate the necessity of labor unions or compulsory arbitrations.

Dismissing "compulsory" arbitration as unpractical, and recognizing that there can be no such thing in fact, it is true that there is a growing respect among railway employees for optional arbitration, and the records of the office of the chairman of the Interstate Commerce Commission, and of the commissioner of labor, show that many strikes have been averted, which doubtless would have resulted in great financial loss to the employing companies, to the striking employees, and to the public. Many amicable adjustments of disputes between railway employers and employees have been reached through the "mediation" provided for in the Erdman act, without these disputes having approached the stage where arbitration was even proposed. The Lemieux act of Canada has, no doubt, averted many similar strikes, not only on railways, but in many other industries. Personally, I believe that great good has been accomplished through mediation under both the Erdman act of the United States and the Lemieux act of Canada.

But there is a vast difference between mediation and arbitration, and it is evident that mediation is not so objectionable to the rank and file of railway employees as arbitration. Mediation, as practiced both in Canada and the United States, results in concession and compromises, to which Mr. Delano seemingly objects. It is because of such concessions and compromises that these acts are beneficial. Usually the employer and employee in labor disputes represent two extremes, both sometimes prompted by selfish motives, and neither giving due consideration to the interests of the other. The great success of the mediation of wage differences in the United States, which has been achieved by Judge Knapp and Dr. Neill, and in Canada by Professor Adam Shortt, and others, is largely due to the fact that they convince both parties that their respective positions are extreme, and that an intermediate position would be fairer to all concerned.

Arbitration awards of any kind might be justly described as "fickle" in that everything seems to depend upon the mood of the arbitrator. We witnessed during the year 1910 quite a large number of arbitrations of railway labor disputes, and while the economic conditions were practically the same in every instance, some of those awards were almost entirely in favor of the company, and others were quite liberal to the employees. I have never heard any one even intimate that any of those arbitrators was other than honest in his findings. This shows that much depends not only upon the man who is selected as the third arbitrator, but the state of his mind at the time the arbitration is conducted and the impression produced upon him by other than general conditions.

Mr. Delano suggests that there should be a "standing court, which by reason of experience and special training, is well fitted to settle such matters." In this were brought about I could name two men, either of whom are intensely honest and conscientious, but whose awards would be at great variance. If the same class of men were selected for these permanent arbitrators that are usually selected for the higher judicial positions, we would find men whose recognition of property rights was more pronounced than of the rights of man. If permanent arbitrators were selected whose life environment had taught them to consider the rights of property above that of the man, they would conscientiously make awards in behalf of the railway investor if proposed wage increases reduced incomes.

On the other hand, there are many men of most excellent character whose environment has been such that if they were assigned as permanent arbitrators of labor disputes they would honestly decide in favor of the men and against property, when questions of wages were at stake.

That this peculiarity of the human mind is evident to others is shown by the fact that there has been such difficulty in finding a man to act as "third" arbitrator, either in the United States or Canada under the existing laws. I am informed that no more trying burden has fallen upon the chairman of the Interstate Commerce Commission and the commissioner of labor than this selection of the third arbitrator. To find a man who is absolutely unbiassed, whose past environment would not make him "naturally" favorable to either property or the individual, is a most difficult task.

If arbitration boards could be made up of four, six, or eight men, none of whom were partisans, an award should be reached with a clearer conception of the equities of the case than under the present plan, but unfortunately working people are extremely suspicious that some men cannot withstand temptation. It seems inbred in the average workingman to distrust those placed in positions where it may be profitable to betray an interest involved. It may be that American political practice, examples of which have recently taken up much of the time of Congress, has led working men to distrust those placed in authority. They realize that if a man in authority is corrupt, and will sell his influence, the employer has a decided advantage. One of the happy features of arbitration under our present laws is that, so far there has not been the least suspicion against any one. But institute a board of permanent arbitrators, and whatever their award might be, unless it were a compromise, it would probably receive condemnation. If the award was extremely favorable to the employees, as suggested in Mr. Delano's letter, they probably would be accused of "playing politics." If their award maintained the employer's contention they would be accused, by some, of having "sold out."

I feel sure that but few railway employees would favor the institution of a permanent board of arbitration, and for largely the same reasons that the owners of property found it necessary to substitute temporary juries for fixed judges in determining the rights of contending property interests. There is no doubt,

as Mr. Delano says, that as at present constituted, a board of three arbitrators is really but one arbitrator with two advisors, each harassing him for a favorable decision for the respective interests.

Experience makes it evident that in the arbitration of wage disputes railways invariably assert their financial inability to pay higher wages. The "financial ability" of railway corporations is one of the unsolved problems of the age. Without taking the magazine "muck rakers" as authority, we can readily believe that there is much connected with railway finances, past and present, that would not easily be understood by an arbitrator. In investigations, state and national, those railway corporations that most eloquently plead poverty, have usually been those that should have been opulent. It would be difficult for a board of arbitration intelligently to pass upon the ability of a railway corporation to pay increased wages, or to pass upon the necessity of a railway corporation reducing wages, without a thorough knowledge of what has been done with all of the money that has been earned by a railway company.

If a shoe manufacturer would be justified in reducing the wages of his shoemakers because his father almost bankrupted the shoe factory by patronizing some "get-rich-quick-concern," a standing railway board of arbitration could reason a like effect from a like cause. If a gold mining corporation had sold its stock from 8 to 15 cents on the dollar and then could secure an arbitration award reducing the wages of miners, because the stock was not paying dividends at a par valuation, railway employees might expect similar awards.

One of the defects of the Erdman act, which has caused railway employees to suffer loss, is that there is no provision for the interpretation of an award. An award is made under the act and then the employer and employee disagree as to what it means. The employer asserts his right to interpret the award and refuses to apply the award as understood by the employees. Even when the arbitrators subsequently meet and endeavor to interpret their own award, railway employers take the position that the Erdman act does not provide for this method of interpretation, and refuse to apply the award as interpretated by the arbitrators themselves. The Erdman act should be amended to the extent that disputes arising out of the award may be adjusted by the same persons who rendered the award.

Summing up the entire matter, it is evident that arbitration is a complex problem; that it has many features to be admired; others that can rightfully be questioned, and some that are justly feared by working people.

W. S. CARTER,
President, Brotherhood of Locomotive Engineemen and Firemen.

ERECTION OF THE KENTUCKY RIVER HIGH BRIDGE.

BY H. H. STARR,
Assistant Engineer, American Bridge Company.

The Cincinnati, New Orleans & Texas Pacific crosses the Kentucky river at High Bridge, Ky., 21 miles south of Lexington, and just below the junction of the Dix river with the Kentucky. Along this portion of the river the water has dug a course for itself in a deep and wide chasm in the limestone formation. At the bridge site this chasm is about 250 ft. deep to ordinary water level and is about 1,200 ft. wide. The cliffs are either precipitous or stand at a very steep slope with bottom lands on one or both sides of the river. The building of a bridge across this chasm was therefore no small undertaking.

As originally planned, John A. Roebling was to build a bridge of the suspension type, and accordingly the building of the towers and anchorages on either side of the chasm was started in 1854. These were completed, but further work was suspended because of financial difficulties, due to the panic of 1857. The towers were built of limestone quarried near the bridge site and stand upon the edges of the chasm 1,240.9 ft. apart center to center. Each consists of two shafts 33 ft. 3 in., center to center, rising to a height of 85 ft. 5 in. above the base of rail.

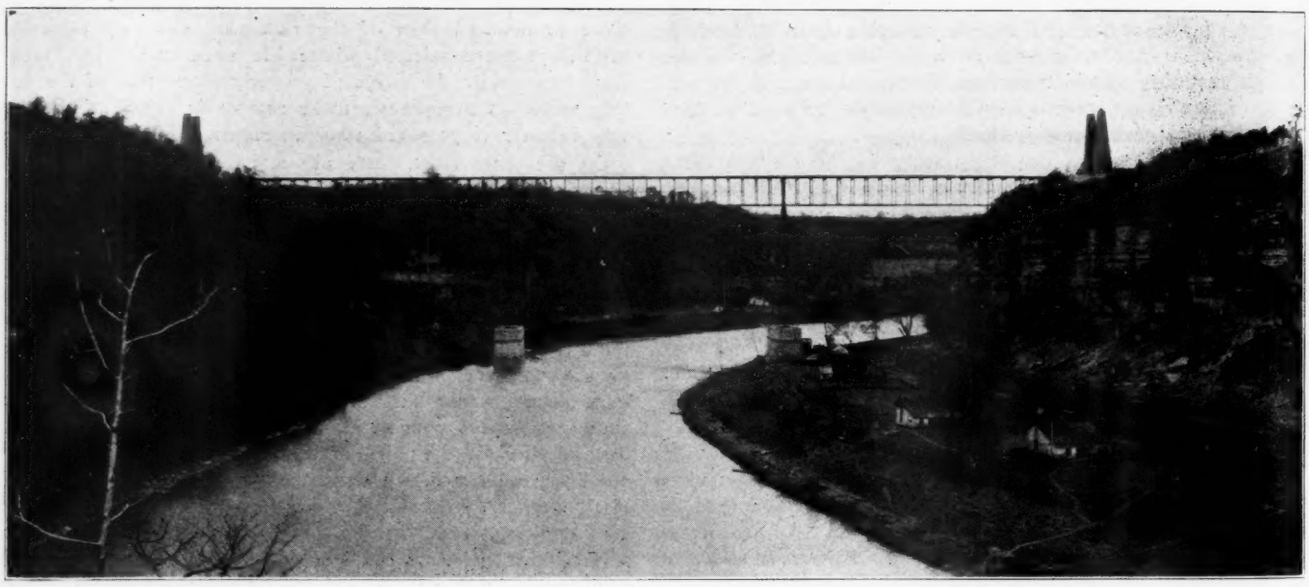


Fig. 1—Old Bridge, Showing Old Towers for Suspension Bridge.

Each shaft is 16 ft. 7½ in. x 24 ft. 7 in. at the base of rail, tapering to 7 ft. 2 in. x 8 ft. 2 in. at the top, the larger dimensions being parallel to the track. They are joined together by a semi-circular arch beginning 56 ft. above the base of rail, and being 16 ft. 2 in. from springing line to top of coping, which is 13 ft. 3 in. below the top of the shaft. See Figs. 1 and 2.

No further work was done about building a bridge at this point until some 20 years later, when the Cincinnati Southern, owned by the city of Cincinnati, built its line from Cincinnati, Ohio, to Chattanooga, Tenn., and bought and used as a part of its line the old Lexington & Danville. The deed conveying this road reads as follows: "Resolved that the Cincinnati, Lexington & East Tennessee Railroad hereby agrees to sell and convey to the trustees of the Cincinnati Southern Railway all the line of railway belonging to this company from its north terminus in Lexington to its south terminus at Nicholasville, Ky., together with all graded roadbed between Nicholasville and Danville, and all the grounds, rights of way, depots and other buildings and structures, including the towers and anchorages for the suspension bridge on the Kentucky river."

At this later time the Cincinnati Southern asked for bids and designs for a bridge across the river at this point, and on July 9, 1875, awarded the contract for both the superstructure and

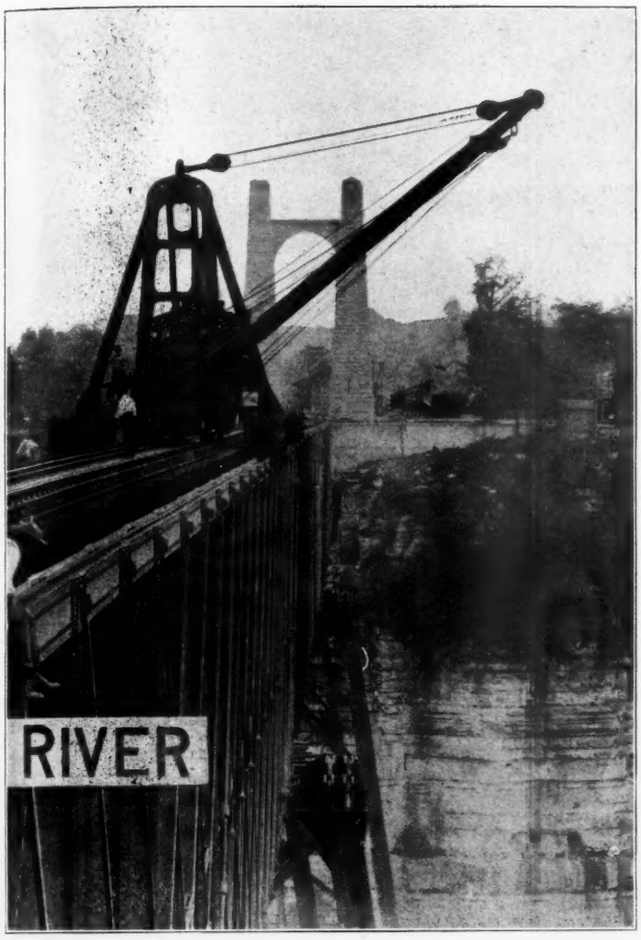


Fig. 2—Setting Lower Section of South Temporary Bent.

the masonry to the Baltimore Bridge Company, C. Shaler Smith, president and designer of the bridge. Thomas Rogers was subcontractor for the masonry, the iron work was fabricated by the Edge Moor Iron Company, Wilmington, Del., while Mr. Smith erected the superstructure himself.

The bridge is of the cantilever type with three openings 375 ft. long. (See Fig. 1.) Each of the two end openings consists of a 300-ft. suspended span and a 75-ft. cantilever arm, while the center span, 375 ft. long, serves as the anchor span and rests on two pyramidal towers. The trusses are deck, pin-connected, 18 ft. center to center for single track, and 37.5 ft. deep center to center of chords, with panels 18.75 ft. long, and are of the multiple system type, having two web systems. Both top and bottom chords are stiff members, built up of plates and angles, and have pins passing through them, forced to place by hydraulic pressure. All diagonal members are eye bars packed on the pins outside of the chord. The posts also are of sections built up from plates and angles or I-beams and channels, and have no connection to the pins, simply bearing against the chords and have the floor beams framing into them at the top.

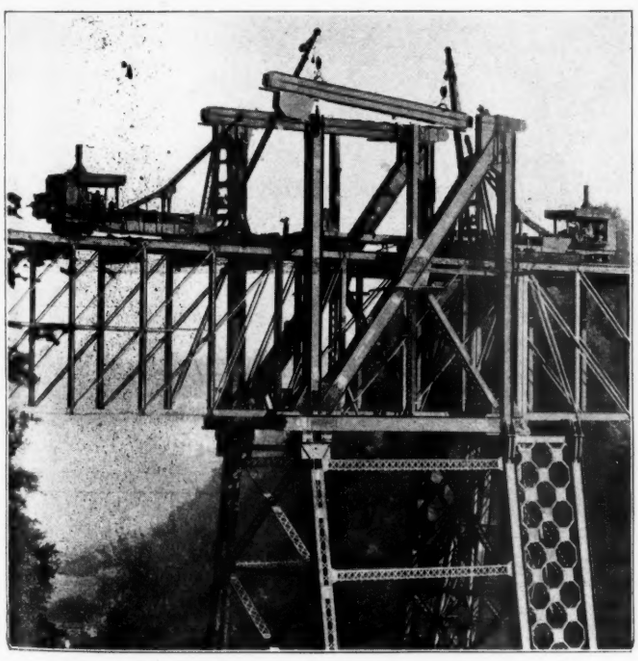


Fig. 4—Setting First Panel of North Span.

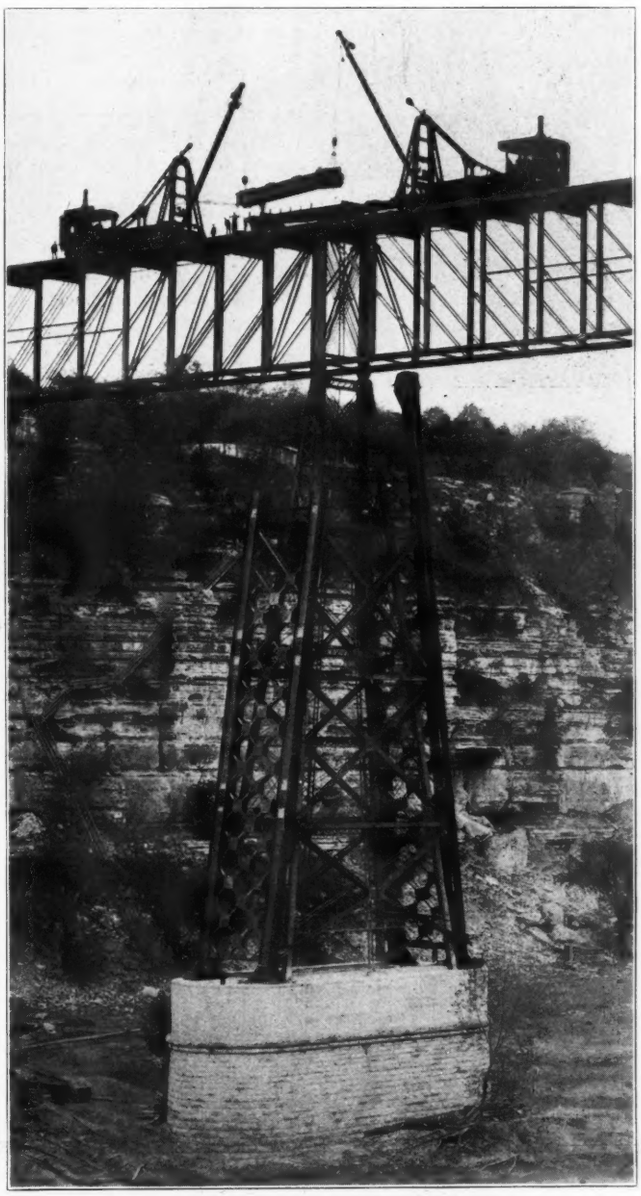


Fig. 3—Setting New North Tower.

Each tower consists of four columns, forming pyramids 173.5 ft. high, which rest upon limestone piers. At the base they are 71.5 ft. center to center of columns by 28 ft. center to center of columns, each column base resting on two nests of rollers at right angles to each other to facilitate movement under temperature changes. The piers were carried down to rock foundations at a depth of about 286 ft. below the present base of rail.

As the depth of the ravine would have made falsework very

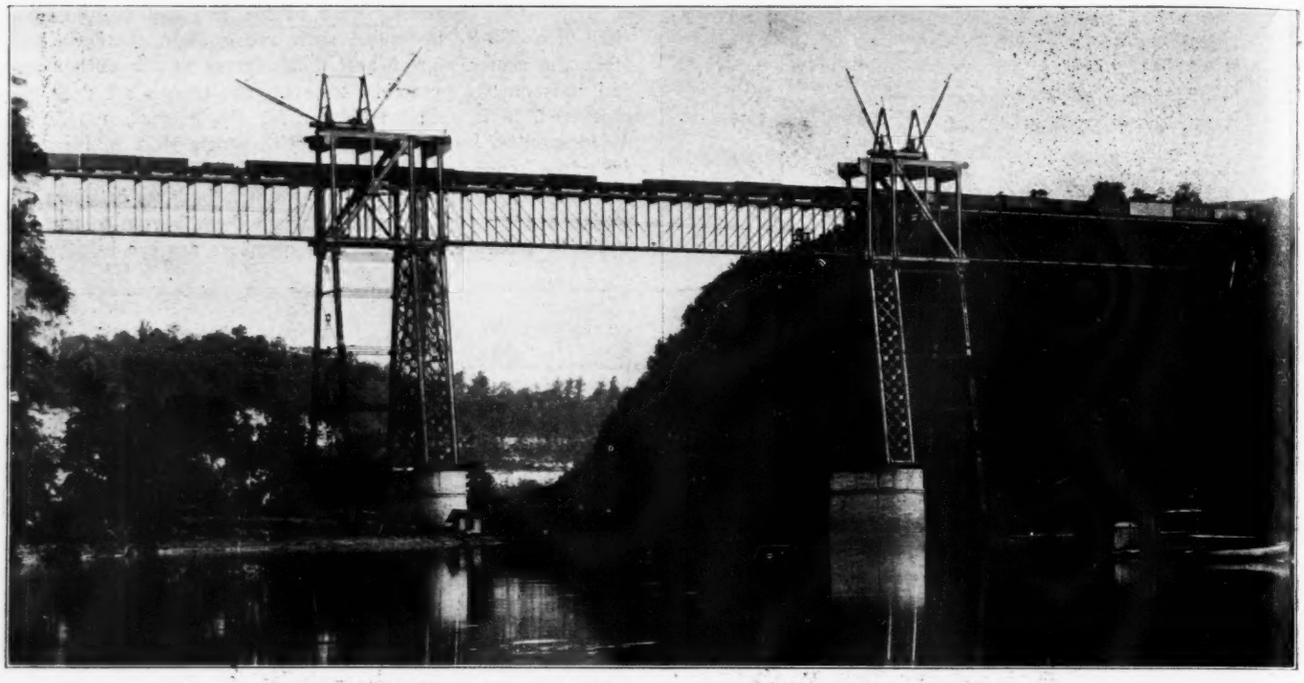


Fig. 5—First Panels of Shore Spans Set Ready for Cantilever Erection.

expensive, and as frequent and heavy rises of the river made falsework unsafe in the center, or channel span, the method of cantilever erection was determined upon. Briefly, it consisted of cantilevering the span out from the north abutment to a point 10 panels out, where a wooden tower had been erected to support the span, as it was cantilevered still farther out to the tower, which in the meantime was being erected with gin poles to meet the span. The north half of the center span was then built out half way. Anchorage for the cantilevering of the north span was obtained by fastening the top chord with bars to the base of the stone tower. Temporary additional rods were used in the tower end of the span to provide for the transmission of erection stresses in the web system. The south half of the bridge was then built out in a similar manner until it met the north half at the center of the center span. The structure now being a continuous girder over four supports, two of them being at varying elevations, it became necessary to cut the bottom chords of the shore spans at the fourth panel point out from the tower and so place the structure in the condition as apparently designed—that of a cantilever bridge.

The official record of the railway states that the erection of the superstructure commenced October 12, 1876, was prosecuted without interruption through the bad weather of the winter and completed February 20, 1877. The bridge was successfully tested April 20, 1877. Owing to the inclemency of the weather on the day of the test, instrumental observations of the deflec-

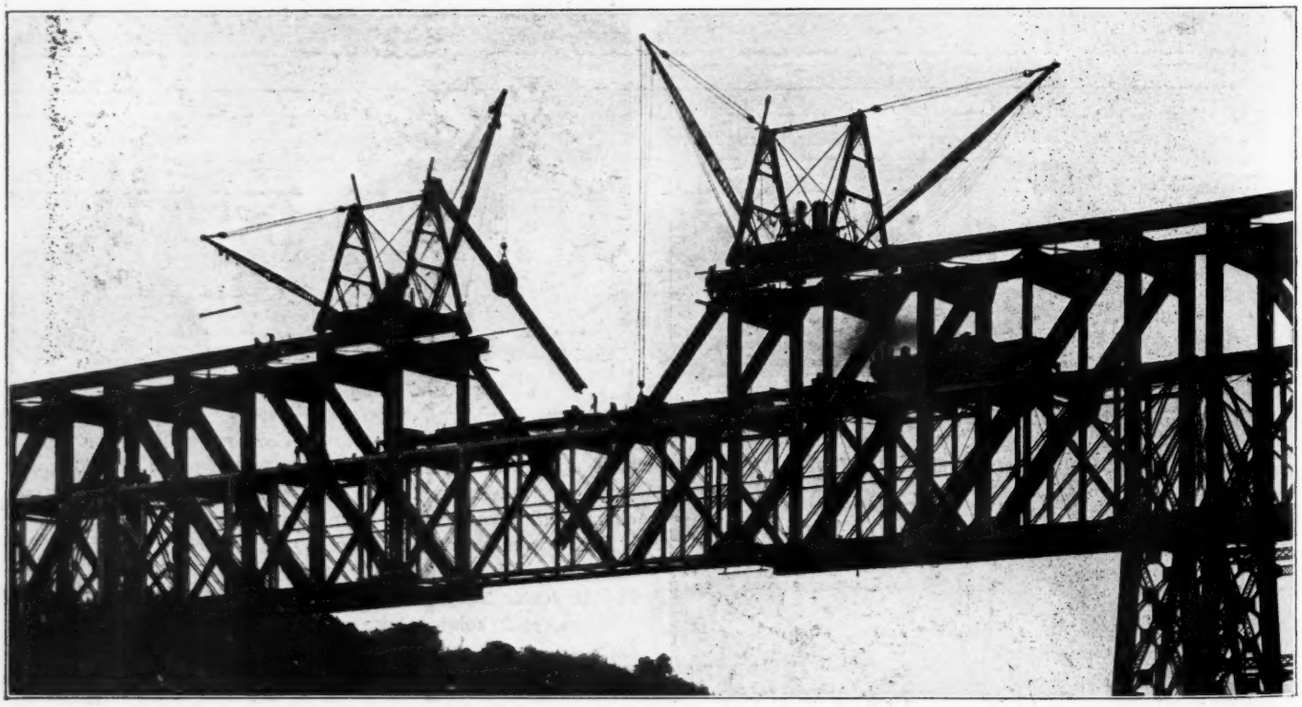


Fig. 6—Setting Center Diagonals of the Center Span; Kentucky River High Bridge.

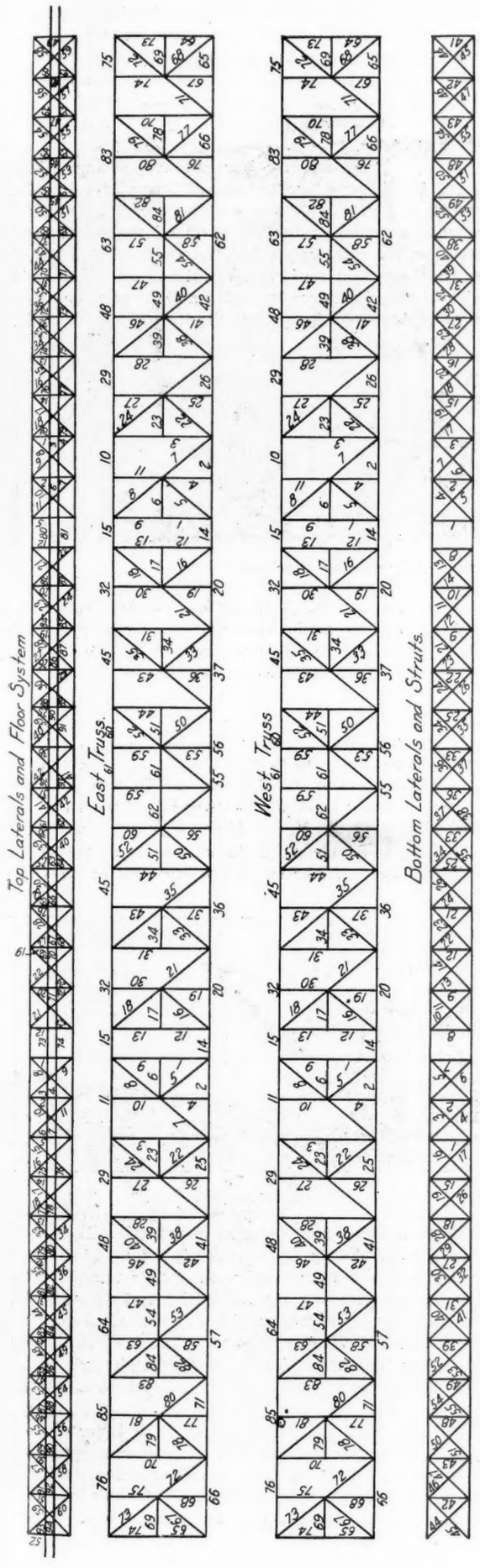


Fig. 7—Progress Report.

tions for each operation could not be taken with accuracy, but were sufficient to show the remarkable rigidity and perfect elasticity of the structure.

The total cost of the entire structure, $404,374, is less than the estimated cost of completing the suspension bridge commenced by Roebling, the towers and anchorages of which were already built.

The cost of superstructure was	$225,420
" " " substructure was	178,954
The weight of iron in spans was	2,855,379 lbs.
" " " " towers was	788,902 "

The old drawings state that the bridge was the highest in the world at that time, being 275.5 ft. from base of rail to low water, and 286.1 ft. to bottom of foundations, although the level of the water in the river has since been raised by dams.

Although the present structure is in good physical condition, the increase in weight of the rolling stock made it imperative to renew this bridge with a heavier one. Opportunity was taken in the renewal of the bridge to improve the alinement and eliminate the heavy down grades which approach the bridge from both directions, these grades making it necessary in hauling heavy freight and passenger trains to use two engines and, in some cases an additional helper. To improve these conditions,

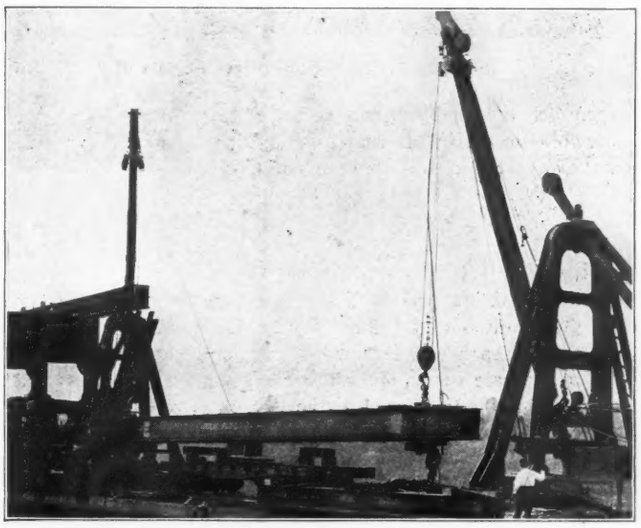


Fig. 8—Handling Top Section of Temporary Bent.

the base of rail of the new bridge was therefore raised 31.3 ft. above the old location.

At first it was intended to build an entirely new structure—an arch bridge, 200 ft. east of the existing one, so as to avoid interruption of traffic during the building operation; but the final design settled upon was for a new structure on the old location.

The new bridge is of the riveted deck truss type, and has three spans, each 353 ft. long, resting upon steel towers and abutments, with two plate girder spans 55 ft. and 69 ft. long, one at each end of the bridge. The trusses are 31 ft. center to center, and 73 ft. deep, of 6 panels, each 58 ft. 10 in. long, sub-divided to 29 ft. 5 in. each for the floor and lateral systems. The floor system is connected to the posts below the top chord. Each tower has two vertical bents 22 ft. apart and about 160 ft. high; 31 ft. center to center of columns at the top, and 78 ft. center to centers of columns at the bottom, and is divided vertically into four bays or sections. The girder spans frame into the end floor beams and into cross girders which rest in pockets in the old stone towers. The old piers were made use of but increased in height by the addition of a reinforced concrete cap about 14 in. thick to give room for the placing of the new tower on the pier. To provide for future double track, the new structure is designed for a double track E-60 loading, although but two lines of stringers are placed at present. As the new struc-

ture is upon the old alinement, it became necessary to construct the new work entirely surrounding the old and allow the traffic in the meantime to be carried on the old structure under the new floor system. As any accident affecting the old structure would probably be of serious consequence, and as the great height of the bridge above the bottom of the chasm made falsework in the erection very expensive, it was therefore imperative that a safe and economical method of erection be decided upon. The method finally chosen was considered to be the best under the circumstances and, briefly, consisted of building out from each tower in each direction by cantilevering and balancing over the tower and a temporary bent until the arms of the center span met at the middle; then building out from the abutments to meet the uncompleted portions of the shore spans.

over two panels of each old truss and were blocked upon and anchored to the old chords at the panel points. After the derrick car had moved out to the proper position the stiff legs were moved out over the I-beams, the connecting links dropped to place and the car wedged up on the I-beams and anchored to them, in this way relieving the old floor system from all load at the front end of the car, except that of the truck. By blocking on the I-beams at the center of an old panel the load could be put into both web systems of the truss (see Fig. 2).

In the fall of 1909 preparations for the receipt of material were made by establishing a yard north of the bridge, and foundations for the temporary bents were prepared. Each of the temporary bents first used was located under the first main panel point of the shore span away from the tower, and consisted of two columns 31 ft. apart at the top and 87 ft. 1¼ in.

Fig. 9—Setting Second Panel Top Chord of South Shore Span; Kentucky River High Bridge.

As the material forming the members is heavy, and the gusset plates quite large, it was thought best to assemble the trusses as a whole at the shop and ream all field holes while the members were in place and match-mark the joints, thus insuring proper fit and quicker erection in the field.

Since a considerable portion of the work at the beginning had to be handled by a derrick car standing on the old structure, and as the old floor system was too weak to allow the car to handle heavy loads while resting upon it, it first became necessary to adapt the car to these conditions. This was done by strengthening the front bolster, and by adding stiff legs and connecting links on each side of the car to widen its base to 18 ft., which was the distance center to center of the old trusses. Twenty-four-inch I-beams were also provided, upon which the car was blocked while lifting; these I-beams extended at the bottom, braced transversely by horizontal and diagonal bracing, and longitudinally by horizontal struts to the new towers. The columns themselves were each formed of two sections of the bottom chord, LO-2 and L2-4, and a post U2-L2 of the permanent material, with additional splice and cap plates and castings to adapt them to the work. The material for the north temporary bent was taken from the south end of the south span, while that for the south temporary bent was taken from the north end of the north span.

The foundations for each bent consisted of a cluster of piles 42 in each cluster, under the foot of each column, capped with 12 x 12 timbers, upon which were placed two tiers of 24-in. 80-lb. I-beams to receive the load and distribute it over the piles. The maximum estimated load was about 15 tons per pile, with an additional load of about 6 tons per pile from wind at 20

lbs. per sq. ft. of exposed area of bridge, making a total of 21 tons per pile. On the north shore the piles were driven down through firm earth of a clay-like nature until about flush with the ground. On the south shore, however, the bent fell just at the water's edge in very soft mud overlying the rock bottom. As the piles stood about 15 ft. out of water, loose rock and earth were dumped in to the water level and the piles afterwards driven through this to the rock bottom.

The erection of the new towers was begun April 21, 1910, the north one being completed on May 9, and the south one on May 21. The method of setting the column sections was as follows (see Fig. 3): The main derrick car, or the car which set all column sections to place, always faced north toward the material yard. At the time of setting any column section the main car moved out to position under its own power and was wedged and anchored to the 24-in. I-beams. The second, or helper car, facing south, moved out with the column ahead of it on a flat car and was in turn wedged and anchored to other 24-in. I-beams. The boom of the main car was set at the proper reach for setting the column in position, the falls of both cars hooked on, the section picked from the flat car, swung over the side of the bridge and slacked into the falls of the main car, which lowered it to the approximate height; then swung out and landed it in permanent position. In the meantime the helper car had been cut loose and backed off the bridge, and if there was sufficient time between trains, had brought out a second section. As soon as all columns of each section or bay were set, all transverse and longitudinal bracing was placed. The heaviest column section weighed 24 tons, while the bottom section weighed 22 tons and was swung out 36 ft. from the center of the bridge. The cast bases weighed 14 tons and were swung out 39 ft. from the center of the bridge. As the transverse bracing on the two lower bays fouls the old tower when in permanent position, these two bays were set in a temporary position to clear the old work until such time as the old tower can be removed. After being erected, both towers were riveted up as far as possible. The time required in setting two column sections averaged approximately two hours for the whole operation.

On July 7 the erection of the temporary bent at the north end of the south span was started, the members being handled by two derrick cars. Owing to the difficulty of temporarily bracing the columns of the lowest section until the permanent bracing could be placed, these two column sections were laid upon the ground, the transverse bracing set, and then tripped to an upright position by two sets of falls running from the top of the new tower to the upper end of the bent section and operated by the spools of the derrick car, which was anchored to the track at the south end of the bridge. The other two sections of each column were set by the derrick cars directly to place, being handled in the same manner as the tower columns. The north temporary bent was set in a similar manner between July 19 and August 3, there being some delay, due to the non-arrival of material. Previous to using the car the various positions of the car, from which the members would be handled, were determined upon and the stresses in the old structure computed to determine the safety of the old structure while under these loadings.

White oak blocking, upon which the bottom chord was to rest, was placed upon the top of each temporary column in two piles, leaving a space between them for the setting of a 500-ton jack. After completing the temporary bents the 24-in. I-beams were moved to the south tower and the derrick cars erected the first panel of the south shore span, which rested upon the tower and the temporary bent. The truss members and bottom laterals were erected first, and the floor beams placed afterwards by jacking the top chords apart to allow the beams to slip down between them. The stringers for the two sub-panels were then placed and the traveler erected upon this panel. The derrick car next erected the first panel of the north shore span with its traveler. Either one or two cars were used in handling each member, as was deemed most advantageous, as shown in Fig. 4.

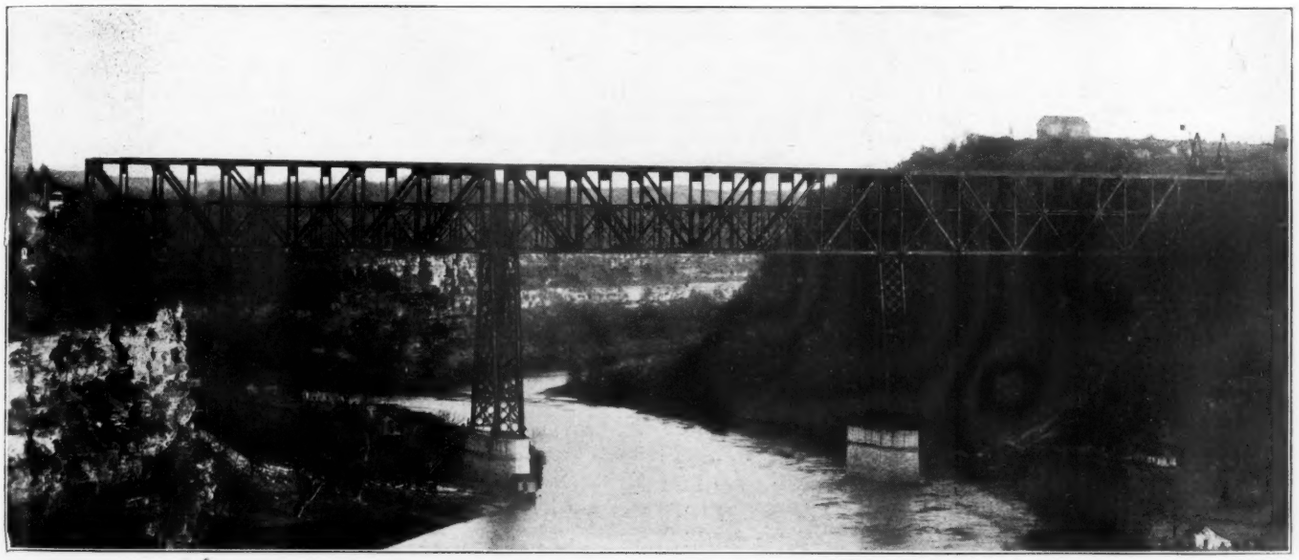


Fig. 10—Spans Completed Except for Stringers.

The travelers were duplicates, each consisting of a steel platform of girders and I-beams mounted on wheels at the corner, with an A-frame and one boom in the center at each end; the A-frames being braced together by a strut connecting them at the top and by diagonal bars running to the corners of the platform. Two hoisting engines were mounted on each traveler and operated the ¾-in. wire cables of the boom and hoisting falls using 13 parts of line for the boom falls, and 9 parts for the load falls. The travelers ran upon traveler runs on the top chord, consisting of rails spiked to 8 x 16 timbers laid flat.

Active erection of the spans with the travelers began on September 12, when various members of the first panels of the center span were set, and was continued until October 6, when the center span was connected (see Figs. 5 and 6). A calculated positive reduction at the top of each temporary bent and at LO of at least 90,000 lbs. per truss was maintained throughout the work by moving the travelers back and forth and setting various members, first in the center span, and then in the shore span, as shown in the accompanying diagram, Fig. 7. To in-

crease the anchorage, the bottom chords of the shore spans were anchored to the temporary bents, and the bents to their foundation. The point L2 of each shore span was erected 1⅛ in. lower than LO at the tower, and the lengths of the tension members UO-UO and the compression members LO-LO over the towers were varied from 22 ft., so as to raise L6 of the center span 10 in. above the horizontal through LO, and insure its not being below the proper position for connecting the center span. As a matter of fact, L2 of the shore span and L6 of the center span were at greater distances from the horizontal, due to compression in the temporary bent, blocking and foundations.

By measurements made after the towers were erected, it was found that they were not exactly 375 ft. apart center to center, and when the last pieces of bottom chord were about to be set, the gaps in the trusses were found about an inch too short to allow the entrance of the chords. This was overcome by placing 30-ton jacks between the old and the new towers and springing the new towers apart as far as possible; then when a train passed over the old bridge the deflection of the center span forced the towers a little farther apart and the chords were slipped into place.

After setting all main truss members and most of the floor beams and bracing of the center span, the L2 points of the shore spans were jacked up until the top chords came together at the U6 joint; then by using special drifts the connection of the U4-L6 diagonal of the south half of the span was made to the gusset at L6. The travelers then filled in as much as possible of the U6-4 panel of the shore spans and removed the temporary bents. On October 18 the 24-in. I-beams were set at the north end of the old bridge, and on the 19th there was started the erection of the temporary steel bent which had formerly been near the north tower. Because of the higher level of th foundations only two sections of columns were used instead of three. The lower half of the bent was erected on the flat car and tripped by Manila falls operated from the derrick car. The top sections were then set and braced and the bent fastened longitudinally to the old structure with wire cables (see Fig. 8).

On October 22 the derrick car began the erection of the first panel of the north shore span at the abutment end in the same manner as at the tower. The trusses and bottom bracing were erected first, and the floor beams omitted to allow the derrick car to run out on the old bridge. The traveler was then advanced to the center of the shore span and assisted the derrick car, which faced south, in setting the members of the second panel. (See Fig. 9.) Because of the droop in the arm of the span cantilevering from the tower, LO and L2 points were erected in a lowered position so as to continue this curve and leave a gap in the top chord for clearance. After placing all the truss members the LO points were jacked up so as to close the opening in the top chord at U4, and with the assistance of special drifts to connect U2-L4 to the gusset at L4. After the remaining floor beams and bracing were placed on November 7 the span was jacked high enough to set the 30-in. segmental rockers and to drive out the 12-in. pins from the shore ends of the tension members UO-UO, which connected the north to the center span, over the north tower. For jacking purposes the two cross girders for use at the stone towers were temporarily bolted to the end posts UO-LO and the span raised by four 500-ton jacks.

After the traveler had removed the temporary bent at the north abutment, work was transferred to the south end of the bridge. The same method was pursued there as at the north end, except that a timber bent 44 ft. high was used instead of a steel one, and in place of the cross girders there were used short 24-in. I-beams spanning each cast base, with two jacks resting upon them and jacking against the gusset plates at LO. After completion of the south span on November 29, the traveler placed the girder span at the south end of the bridge, and from there proceeded to set all the stringers for the whole length of the bridge and the girder span at the north end. (See Fig. 10.) In the meantime riveting had been started on the bottom chord joints and bottom laterals, using oil forges for heating the rivets. After all possible erection had been completed all forces were turned to riveting and the traveler was used for carrying swinging scaffolds, the forges and rivet supplies during the riveting of the upper chord joints.

As trains are still operating upon the old bridge, owing to the non-completion of the approaches by the railway company, the upper panel of sway bracing has been omitted until trains can be run over the new structure. Many of the lower panels of sway bracing are in a temporary position, due to interference with the old diagonals. After the removal of the old structure these will be changed, and the rods lengthened by short pieces and sleeve nuts.

The total weight of the new bridge is 7,046 tons. The heaviest member handled by one derrick car was LO-2, weighing 26 tons. The heaviest member handled by the traveler was L4-6, weighing 34½ tons.

The track at the north end approaches the bridge on the general surface elevation, while at the south end it leaves the bridge through a rock cut. As the new base of rail is 31.3 ft. higher than the old one, a change in the approaches was necessary. At the north end this was cared for by a heavy fill at one side of the present temporary alinement and a wooden trestle at the immediate end of the bridge. At the south end, girders span the cut and carry the stringers and track for deflecting the traffic to a new alinement.

All masonry work was done by railway forces, under the direction of Horace Baker, general manager, and Curtis Dougherty, chief engineer, of the Queen & Crescent Route. All plans were prepared and all work, both shop and field, was performed under the direction of Gustav Lindenthal, consulting engineer for the C. N. O. & T. P. The shop drawings were made and the steel work fabricated by the Ambridge, Pa., plant of the American Bridge Company, and erected by the eastern division erecting department, American Bridge Company of New York. H. F. Lofland was general manager of erection; J. B. Gamberling, division erecting manager; Daniel Burns, foreman in charge of the field work at High Bridge; and the writer, resident engineer in charge. The writer is indebted to Curtis Dougherty for data regarding the cost and official records of the old structure.

FOREIGN RAILWAY NOTES.

The Chinese ministry of communication has decided to devote the money raised for the Shanghai-Ningpo line to build the Kai-fong-Kai-chow railway. This was not used for the Ningpo line, on account of the local opposition to a foreign loan. The minister agrees to a British engineer, that British material will be purchased, and that the amount of the loan be increased.

The Trans-Paraguayan Railway is in three great sections, their approximate lengths being as follows: Sao Francisco, Brazil, to Uniao, 248 miles; Uniao to Iguassu Falls, Paraguay, 373 miles; Iguassu to Asuncion, 248 miles. About 60 miles up from the coast, and part of the most difficult section, is already built. The section from the coast to Uniao ought to be completed in two or two and one-half years. The line from Uniao to Iguassu Falls will require five or six years. Speed should reach 45 miles an hour, and the whole run be accomplished in between 36 and 48 hours, nearer 36. The line already in existence when the Trans-Paraguayan plan was taken up had been built and run by a small private company. The grades average 1½ per cent. Rolling stock and equipment on the Trans-Paraguayan are to be the same as that in general use on the Sao Paulo-Rio Grande; American locomotives and largely American cars, particularly the passenger cars.

JUDGE SANBORN ON STATE INTERFERENCE WITH INTERSTATE COMMERCE AND VALUATION OF RAILWAYS.*

VALUATION AND A "FAIR RETURN."

The master also found that the maximum state rates prescribed by these acts and orders produced incomes insufficient to pay the cost of earning them, taxes and just returns upon the real values of the Minnesota properties of the defendants respectively used to carry on their intrastate commerce in that state. The actual earnings, taxes, and cost of conducting transportation during the year ending June 30, 1908, the year when the fares and all the rates, except the commodity rates, were in actual operation, were proved, and the master found that the net freight income for that year of the Northern Pacific Company from its Minnesota intrastate freight business yielded an annual return of only 1.941 per cent. on the value of its property used to produce that income, and that if the commodity rates had been in operation this percentage would have been still smaller, that its net income from its intrastate passenger business was sufficient to yield an annual return of only 4.2 per cent., and its net income from all its intrastate business in Minnesota an annual return of only 2.909 per cent. of the values of its property assignable thereto respectively. He reported that the net income of the Great Northern Railway Company from its Minnesota intrastate freight business was sufficient to yield an annual return of only 5.468 per cent. of the value of its property assignable to that business, and if the commodity rates had been in force the return would have been less than 5 per cent., that its net income from its Minnesota passenger business yielded a return of only .925 per cent. on the value of its property assignable to that business, and that the net income from all its Minnesota intrastate business was sufficient to yield an income of only 3.359 per cent. on the value of its property assignable thereto. His report is that, if the acts and orders of which complaint is made had been in force during the fiscal year 1907, the year to which the proof is expressly addressed in the case of the Minneapolis & St. Louis Company, the net income derived from that company's Minnesota intrastate business would have been sufficient to pay an annual return of only 2.93 per cent. on the value of its property assignable to that business, that the net income derived from its Minnesota passenger business would have yielded an annual income of only 1.79 per cent. on the value of its property assignable to that business, and that its Minnesota net income from intrastate freight and passenger business would have been sufficient to earn an annual return of only 2.47 per cent. on the value of its property assignable to all its Minnesota intrastate business.

Numerous exceptions are leveled at the master's findings of the values of the Minnesota properties of the companies used to conduct their intrastate transportation on the ground that they are too high. Evidence of the cost of reproduction of the Minnesota property of each of the companies, of the original cost of acquisition and construction thereof, and of the average market value of the stocks and bonds of each of the companies for a reasonable period of time prior to June 30, 1908, was introduced before and considered by the master.

The master found the original cost of the acquisition and construction of the entire railway systems of each of the companies and the proportion thereof assignable on a track mileage basis to Minneapolis. The amounts thus found prove to be much less than the values ultimately found by the master, and for this very good reason: These railways were pioneers; they were built in large part over the prairies of Minnesota before they were settled and before many of the existing towns, villages and cities along their lines came into existence. A large part of the right of way of the Northern Pacific was granted to it by the nation. The cost of rights of way from five to forty years ago through wild lands, and through towns and villages whose population and the value of the property in which have since been multiplied by from 2 to 10, is obviously no criterion of the value of those rights of way in 1908, when they were used under these fares and rates and when agricultural lands in Minnesota were worth from $35 to $100 an acre, and rights of way and lands for yards and sites for stations in cities like St. Paul and Duluth have wonderfully increased in value. It is a fair return upon the reasonable value of their Minnesota property in 1908 to which these companies were entitled, and the cost of that property at times varying from five to forty years ago may be some evidence; but it is certainly no criterion of its value in that year. In view of these facts, the master rightly decided that the cost of reproducing this property new was a more rational and reliable measure of its real value than the original cost of its acquisition and construction or the market values of the stocks and bonds of the companies, and upon that basis he made his findings.

The railway commission seems to have reached the same conclusion at an earlier date, for in the first part of the year 1906, before these suits were commenced, they had employed Dwight C. Morgan as their engineer and had instructed him and had requested the railway companies to find the respective values of their railway properties in Minnesota on the basis of the cost of their reproduction new.

A schedule of about forty items originally suggested by the commission, and perhaps subsequently somewhat modified, was used by both parties in these cases, and their evidence was directed to the values of these items on the basis of the cost of their reproduction new.

The first and largest item on the schedule was "lands for right of way, yards and terminals." In the case of the Northern Pacific Company the evidence on behalf of the complainant tended to show that the cost of reproducing this item was about $25,000,000. The claim of counsel for the commission now is that the value of this item does not exceed $9,498,099, and the master found that the cost of its reproduction and its value were $21,240,562. Mr. Morgan had never bought and sold any real estate, except his homestead, nor was he acquainted with the value of real estate in general. To ascertain the value of the terminals in each of the three cities he took from the county records the considerations recited in the records of deeds of a large number of lots and lands in each of the cities, compared them with the assessed values of those lots and lands, and found the per cent. that on the average the assessed values were of the considerations recited in these records. In St. Paul this was about 60 per cent. He then laid out strips of lands of varying widths along each side of the railway lands he desired to value, divided these strips into such sections as he thought were of about uniform value, found the values of the land in these sections from their assessed values on the theory that the assessed values were, in St. Paul, 60 per cent. of their real values. From these values of the sections of his strips he deduced the values of the railway lands between the strips by a comparison of areas. To the values of the railway lands thus ascertained he added 75 per cent., because in his opinion it costs railway companies 75 per cent. more than the normal market value of lots and lands in these three cities to obtain such irregular tracts as they need and now own. To ascertain the value of the lands outside of terminals, he searched out himself and by means of employees the prices at which many lots and lands throughout the region traversed by the railways had been sold, and from these prices he estimated the value of the lands of the railway companies, and then multiplied these values by three, because, as he testified, it costs railway companies three times the normal value of lands to procure the irregular tracts necessary for their rights of way and station grounds through agricultural lands and the smaller towns, cities and villages. By these means Mr. Morgan found and testified that the cost of reproduction, and hence the present value of the land for right

*The abstract of Judge Sanborn's opinion dealing with state interference with interstate commerce appeared April 21, p. 949.

of way, yards and terminals of the Northern Pacific Company was $15,385,078. At the request of counsel for the defendants he made another estimate in which he omitted to use the multiples 75 per cent. of the normal terminal values and three times the normal values of lands outside the terminals, and disclosed therein the fact that if these multiples were not used his estimate would become $9,498,099, the value for which counsel for the defendants argue. But neither Mr. Morgan nor any other witness came to say that the latter was the true cost of reproduction or the real value of this item of the schedule. The defendants also introduced evidence of purchases and sales that tend to sustain Mr. Morgan's estimate of the value of this item.

On the other hand, the evidence for the complainants was, as to the terminals in the three cities, the testimony of three residents of each of those cities engaged in the real estate business, of long experience and accurate knowledge of the values of real estate in their respective cities, as to the values of the terminals of each of these companies, the testimony in the Northern Pacific case of Mr. Cooper, the land commissioner of that company, who was in charge of its rights of way and had purchased for it since 1903 property for which there had been paid $6,139,542.35, and who had a general knowledge of the property in question and its value, the testimony in the cases of the other companies of offices thereof similarly qualified, and evidence of purchases and sales which tend to sustain the evidence of these witnesses. As to the lands outside of the terminals, the Northern Pacific Company produced the testimony of Mr. Cooper and proof of purchases and sales for railway purposes which tend to prove that his testimony of the cost of reproduction and the value of the property was not substantially above prices that had actually been paid for like property. He testified that he had much knowledge from his experience and observation of the cost and value of these lands outside the terminals, and he verified his knowledge by investigating the purchases and sales of property in the vicinities of these various rights of way, that the necessary cost of obtaining such rights of way by a railway company was three times as much as the normal value of the land, and that his testimony of the value of these tracts was based upon that fact. The evidence in the other two cases was of the same character. In each of the three cases the master added to the values of the terminals in St. Paul and Minneapolis, established by the testimony of the real estate dealers and Mr. Cooper, 5 per cent. for the cost of acquisition and consequential damages and to the values of the lands for terminals in Duluth, verified by the witnesses for the companies, 25 per cent. for railway value and the cost of acquisition and consequential damages, and from the values of lands outside terminals, established by the evidence for the companies, he deducted 25 per cent. The result was that his ultimate finding of the value of the first item in the schedule was about $4,000,000 below the value which the testimony of all the witnesses, except Mr. Morgan, sustained, about $6,000,000 above that which Mr. Morgan's testimony supports, and about $11,000,000 above the amount which counsel for the defendant now urge the court to adopt. This finding of the master is assailed because he allowed 5 per cent. of the value of the terminals for cost of acquisition and consequential damages, because he increased the values of the terminals at Duluth, established by the testimony of the real estate dealers, 20 per cent., for the reason that they failed to give due weight to the value of these terminals for railway purposes, because the companies, estimates of the value of this item included an addition to the values of the St. Paul and Minneapolis terminals fixed by the real estate dealers of 25 per cent. thereof for railway value, and because he failed to follow the theory of Mr. Morgan and to adopt the value which Mr. Morgan would have found if he had discarded his multiples.

But the evidence in this case is conclusive, nay, we may say it is without conflict, that every railway is compelled to pay more than the normal market value of property in sales between private parties for the irregular tracts it needs and acquires for rights of way, yards and station grounds. The defendants' witness, Mr. Morgan, testified that in his opinion the companies necessarily paid three times the normal value for the lands outside of the terminals in the three cities and 75 per cent. more than the normal value for their terminals within those cities. The master in effect found that the cost of reproduction and the present value of the lands for the terminals in the three great cities, including therein all cost of acquisition, consequential damages, and value for railway use which he allowed, was only about 30 per cent. more than the normal value of the lands in sales between private parties. He found the value of the lands outside the terminals to be only twice their normal value. Findings of lower values would have been contrary to the great weight of the evidence and without substantial support therein.

The measure of the value of real estate is its market value for its most available use.

But counsel argue that this court should disregard Mr. Morgan's multiples and fix the value of this entire item at the amount that his estimate would produce if his multiples were not used, $9,498,099, because the original presumption was that the fares and rates fixed by the legislature and the commission were just and reasonable, clear proof was requisite to overcome that presumption, if there is any substantial evidence to the contrary the proof is not clear, and the master's findings must be presumed to be wrong, and Mr. Morgan's evidence is sufficient to enable one fairly, in the exercise of an honest judgment, to disregard the findings of the master and the evidence which supports it, and to adopt the lowest value claimed. This contention is urged with such force and frequent repetition in brief and argument, and is applied so persistently to the various specific findings of the master, that it deserves consideration.

But the question whether fares and rates which have been put in operation confiscate the property of the companies in violation of the Constitution of the United States is a judicial, and not a legislative, question. And when that issue is presented the rules of law, of equity and of practice applicable to the determination of judicial questions have effect. When, therefore, rates have been tried by actual use for many months, and their effect has become known and is proved, when the issue whether or not they take the property of the railway company without just compensation has been made in a competent court, and all parties have introduced, in the presence and subject to the cross-examination and rebuttal of each other, all the evidence they desire, when that issue and the numerous subordinate issues it involves have been heard and decided, as they have been in the case in hand, by a master, who has personally heard the testimony of every witness, received and examined all the evidence, and made specific findings of every material issue of fact in the case, the judicial presumption arises that his findings are right. This is a presumption of reason as well as of law, a presumption that forces itself upon and compels the reflective mind. Take the general issue. The legislature and the commission decided it upon the information they had acquired as to the probable effect of the rates they were making before those rates were tried. The master decided it after the fares and all the rates, except the commodity rates, had been tried for many months and their actual effect was known and proved. The former decision was based on the conjectural effect of the rates, the latter on their actual effect. The master decided this issue upon a full trial, in which all parties produced all their evidence, subject to the cross-examination and rebuttal of each of the other parties, in the manner which the wisdom and experience of centuries has taught is most conducive to the discovery of the truth and the administration of justice. The legislature and the commission decided it without such trial or such proof.

Doubtless if the fares and rates had been tested by the actual operation of the railways under them, and the plenary proof of their effect and of the other facts presented to the master had been introduced before the legislature and the commission, they would have reached the same conclusions which the evidence forced upon the master's mind. They decided the issue upon evidence more conjectural or speculative; he, upon proof more certain and conclusive.

Returning now to the finding of the value of the first item of the schedule, it is sustained by the testimony of nine real estate dealers familiar with the values of the properties in their respective cities, by the testimony of the officers of the companies who were well acquainted with the properties and their values, who had purchased rights of way that cost many millions of dollars, and by the corroborative evidence of purchases and sales at prices approximating the values found. It is met by the theoretic value of Mr. Morgan, based on his assessment sales method of proof, and by evidence of purchases and sales corroborating it. But the foundation of this value is what copying clerks wrote that grantors in deeds wrote were the considerations of their conveyances of certain properties, and all of these parties were strangers to the parties to this suit. It is conditioned by Mr. Morgan's opinion of the number of such considerations it was necessary to use to discover the true relation of considerations of deeds or presumptive values of properties described therein to their assessment values, by his opinion as to the width of the strips on each side of the rights of way and as to the number and the lengths of the sections of the strips requisite to ascertain just measures of the values of the rights of way between them. He concedes, and counsel for the defendants do not deny, that his method would not reliably indicate the value of any specific lot or tract of land of moderate dimensions, and it is difficult to understand how it can escape the maxim, "falsus in uno, falsus in omnibus." A careful consideration and analysis of Mr. Morgan's testimony and of the other evidence introduced to support it has convinced that they are too indirect, uncertain and inconsequential to overcome the direct and convincing proof of the values of these properties which the complainants have made, and the exceptions to the master's findings of these values must be overruled.

Exceptions were taken to the allowance of interest at 4 per cent. per annum on the cost of the reproduction of the railway properties during one-half of the estimated times of their construction. But the evidence is conclusive that moneys invested for the purchase of rights of way for, and in the construction of, railways, ordinarily produce no net income during the period of construction, that the amount of capital thus losing returns is ordinarily equal to one-half of the cost of reproduction during the entire period of construction, or to the entire cost during one-half of that period. There is no doubt that interest at a fair rate on the capital invested in materials and labor that remain idle during construction is as much a part of the cost of constructing or reproducing a railway as is the money paid for those materials or that labor. Brunswick Water District v. Maine Water Company, 99 Me. 371, 59 Atl. 537, 542. Mr. Morgan, the engineer and witness for the defendants, allowed in his report to the commission, and verifies the justice of an allowance of 4 per cent. per annum during one-half of the period of construction; but the amounts he allowed were less than those found by the master, because his estimates of the cost of reproduction and of the times requisite for construction were less. The weight of the testimony on this subject, however, sustains larger amounts than those fixed by Mr. Morgan or the master, and there was no error against the defendants in the latter's finding and allowance of the item here under consideration in either of the cases in hand.

The Minnesota Transfer Railway Company is a corporation and the joint agent of the owners of ten different lines of railway for the interchange of their freight traffic in St. Paul and Minneapolis. Each of the ten owners owns one-tenth of the property of the Transfer Company by virtue of an ownership of stock. The St. Paul Union Depot Company is a like corporation and joint agent of the owners of nine lines of railroad for the exchange of their passenger traffic, and it is owned by nine constituents in the same way. Each of the three defendant companies owns one share in each of these terminal companies, and the latter corporations and their properties are operated and used as tools of the railway companies that own them, to conduct transportation for their exclusive use and benefit. The defendants complain because the master allowed to each of these three companies $1,186,191 as the cost of reproduction and the value of their respective interests in the property of these subsidiary companies, and because he allowed to the Northern Pacific $1,180,151 for the cost of reproducing and the value of its interest in a similar corporation and its property used by the Northern Pacific for a like purpose at Duluth. It is not claimed that these interests are not worth, or that their cost of reproduction would not be, the amounts allowed; but it is contended that these values are not allowable at all, because they are represented by the stocks and bonds of the subsidiary companies. But these interests in these terminal corporations and their property are the most indispensable parts of the Minnesota properties of the defendant companies used to earn the fares and rates here in question, and any estimate of the value or of the cost of reproduction thereof which omitted the value or the cost of reproduction of these interests would have been incomplete and deceptive. The master rightly considered and allowed their value.

There are exceptions because the master allowed to the Northern Pacific $1,613,613, to the Great Northern $3,219,642, and to the Minneapolis & St. Louis $608,896, for the solidification and adaptation of their respective railways, and deducted nothing from the cost of reproduction for depreciation. But these amounts are those allowed by the defendants' engineer and witness Morgan in his original estimates of the cost of reproduction which he reported to the commission, and there is much other evidence in the record to sustain them. It is clear that a new railway may appreciate or depreciate as it grows older. It may be renewed, repaired, and improved day by day until the whole property becomes more valuable than it was when it was first constructed. On the other hand, its embankments and its roadbed may be neglected until the entire property suffers great depreciation. Whether at a given time a railway property is more or less valuable than it would be if it had just been constructed is a question of fact, that in a suit of this nature must be answered by the evidence. That evidence in this case is that the railways, rolling stock, and appurtenances which constitute the great transportation machines of these companies in Minnesota are in better condition for use, more efficient, more steadfast, better adapted to each other, than if their construction was just completed, that all depreciation has been offset by appreciation, and that values to the amounts here allowed by the master have been added to the values of these properties new, by their age, their repairs, their renewals, their adaptation, and their assured efficiency that comes from constant careful maintenance and operation. There was no error in these allowances.

The master divided the values of the Minnesota properties between freight business and passenger business and between interstate business and intrastate business on the basis of the respective gross earnings of these classes of business. Counsel for the defendants challenge this basis of division, and contend that the apportionment should have been made on the basis of the use made of the property by each of these classes of business, measured either (1) by the aggregate number of the ton miles and passenger miles of the respective classes, or (2) by the aggregate number of the car miles and engine miles of these classes. They say that if that proportion of the value of the property of a company which the number of ton miles hauled

by it in Minnesota bears to the aggregate of its ton miles and passenger miles in Minnesota be assigned to its freight business, and that proportion which its number of passenger miles bears to the same aggregate be assigned to the passenger business, and if that proportion of the value thus assigned to the freight business which the aggregate of the car miles and engine miles appertaining to the intrastate freight business bears to the car miles and engine miles used in the freight business be assigned to the intrastate freight business, and the same method be pursued in apportioning value to the intrastate passenger business the apportionment will be more equitable and just. The issue is between apportionment by use without regard to the worth or value of the use and apportionment according to the value of the use. The latter basis seems to be more logical and rational. Capitalization is founded on the worth of use, not on mere use. The value of property and of investment in every form is measured by the value of its use, not by its use divorced from the value thereof. The Minnesota railway commission, the railway companies, all rate-makers, base their rates primarily on the worth of the use of the railway machines by the various classes of freight and by the passengers, and not on the amount of that use. The rate for hauling a ton of merchandise of the first class a mile is not five times the rate for hauling a ton of merchandise of class E a mile, because the former ton mile uses the railway property five times as much as the latter, but because the use by the former is worth more than the use by the latter. Moreover, there is no unit of measurement of ton miles and passenger miles, of freight car miles and freight engine miles, or of passenger car miles and passenger engine miles, divorced from the values of the uses they make of the railway property, from the classes of loads they carry and the distances these loads are hauled. Indeed, there is no proportioning or measuring relation between such varying uses of property, when no regard is given to the values of these uses.

On the other hand, the values of the uses, the earnings of the property, unavoidably condition the value of the property used, and present a natural and equitable basis of apportioning that value to these uses. Cases may indeed be imagined in which this basis does not produce persuasive results. One of them was suggested by Mr. Justice Brewer in Chicago, Milwaukee & St. Paul vs. Tompkins, 176 U. S. 167, 176, and others of like character have been presented in argument by counsel. But no basis has been suggested and none has been discovered which seems to be more equitable or more accurate. It may be that there is no basis or method that brings perfect or ideal results. But because the ton mile and passenger mile basis has no common unit of measurement, because that basis and the car mile and engine mile and the passenger car mile and passenger engine mile basis exclude the effect of the values of the uses made of the railway property by the various classes of freight and by the passengers carried, because there is really no proportioning relation between uses divorced from their values and the value of the property used, because these bases ignore the differences in the classes of freight carried and in the distances they are hauled, because the apportionment of the value of railway property on the basis of the gross earnings of the classes of business, which disclose approximately the values of their uses of it, gives effect to these material differences, appeals more persuasively to the reason and produces results more equitable than any other basis suggested, and because this basis has commended itself to the judgment of, and has been adopted by, the courts upon whom duties of apportionment of this nature have been imposed in like cases, the master was justified in following their decisions and his action and report in this regard is confirmed.

Complaint is made that the master finds that the companies are entitled to a net return of 7 per cent. per annum upon the respective values of their properties devoted to this public use. The character of the business in which an investment is made, the locality in which it is placed, the returns secured in that locality from other investments of a similar nature, the uniformity and certainty of the return, and the risks to which the principal and the income from it are subjected condition the measure of a fair return upon capital invested. An investment in a bank, in a factory, in a mercantile, manufacturing or agricultural business, is substantially free from regulation by the government and exempt from any duty to the public, except that of paying taxes. If the business in which such an investment is made is unprofitable, its owners may promptly discontinue its operation until more prosperous days come and then return to their undertaking. An investment in a railway which operates in many states is subject to the regulation of its business by many governments. Its owners owe the duty to the governments and to the public to operate their railway continually in days when its operation is unprofitable as well as when it is remunerative, a duty they must discharge under the penalty of forfeiture of their property if they fail. In view of these facts, they ought to be permitted to receive a return large enough to enable them to accumulate in prosperous days a surplus sufficient to enable them to protect their property in days of disaster and to make their average return through days of prosperity and of adversity fair and just. The lands in Minnesota through which these railways extend are fertile and productive. The cities, villages and towns they reach are rapidly increasing in population and wealth, and the people they serve are thriving and successful. The evidence satisfies that the railways are maintained in excellent condition, that they are efficiently and on the whole economically managed and operated, and are rendering commendable service. Justice to the thriving people they serve does not require that the owners of these railway properties should be deprived of a fair return upon their values. To deprive them of such a return would prevent advances and tend to compel reductions in the wages and salaries of their employees, would tend to prevent the extension of their lines in portions of the state where the development and accommodation that railway service assures would be welcome and may be needed, to deteriorate the character of the service they render, and to retard the general prosperity. The legal rate of interest on a debt in Minnesota, in the absence of contract, is 6 per cent., and by contract it may be 10 per cent. per annum. Rev. Laws Minn., 1905, Sec. 2733. Rational investments in agricultural, manufacturing, mercantile and other industrial pursuits, and even well-secured loans, yield returns in Minnesota corresponding with these lawful rates. Investments in railways and the returns thereon are at the risk of failures and partial failures of crops, of the disasters, delays and expenses of unusual storms, snow and cold, of the great financial disasters which occasionally prevent or delay the movement of traffic, and of the burden of continuous operation whether profitable or unremunerative. It is an axiom in economics that the greater the risk the greater must the return be upon invested capital, and the conclusion is irresistible that a net return of 7 per cent. per annum upon the respective values of the properties of these companies in Minnesota devoted to transportation is not more than the fair return to which they are entitled under the Constitution of the United States.

It is proposed to run the Fukien Railway, China, along the northern bank of the North river as far as the town of Pholam, and to build a bridge across the river at that point, curving southwards to the city of Chang Chow Fu. This would be done to avoid the almost prohibitive cost of bridging the North river so far down as the Kang Tang Kio bridge, which would be the nearest and most natural route to the city of Chang Chow Fu. The proposed bridge would make the distance from Amoy to Chang Chow Fu considerably longer, but it would tap two most lucrative sources of income—the very large North river area and the extensive Chang Ta county.

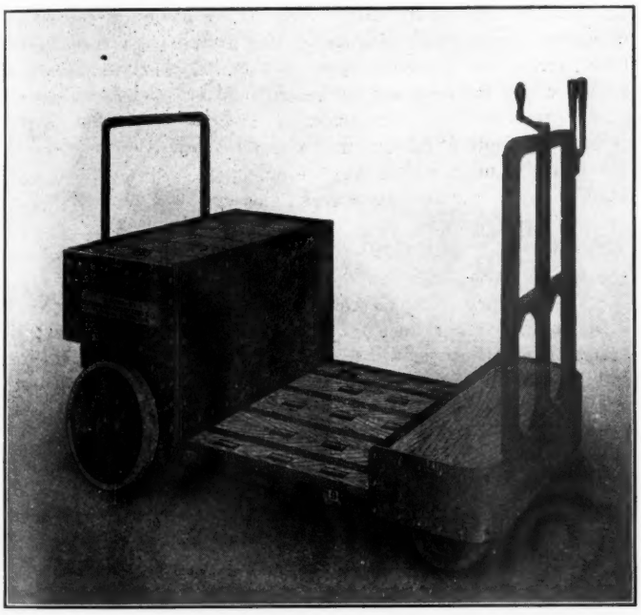
MOTOR DOLLY FOR HANDLING MISCELLANEOUS PACKAGE FREIGHT.

BY GEORGE B. FRANCIS,
Consulting Engineer, Westinghouse, Church, Kerr & Co.

During the past two years railway transportation men and engineers have been giving much attention toward the reduction of the cost of freight handling at the large terminals by means of mechanical apparatus.

It is said that the largest cost item in freight transportation is the one at the terminal, and that this is the place where there has been practically no improvement since the earliest days of railroading. This applies particularly to the outbound and inbound freight houses where it is necessary to move all sorts of packages from any one spot to any other spot, to sort the packages in the outbound house for classification, so that the proper rates may be applied to the particular weights of individual consignments, and to sort them again so that the individual consignments may be trucked to the right car for destination.

It is also necessary to have some positive method of checking so that truckmen do not leave the packages in the wrong car,



Motor Dolly.

through carelessness, without it becoming instantly known to those in charge.

At the inbound house the weighing and classification therefor and the sorting for destination, other than placing the package in the proper section of the house for final delivery to teams, is done away with. Thus the movement of packages from any one spot to any other spot at the inbound house is more simple than at the outbound house.

Up to the present no method of moving packages in these two kinds of houses has been found equal in efficiency or more economical in cost than the hand truck and hand power, which have been with us from time immemorial. Where freight of one classification must be moved from some one point to some other one point there are many successful methods of doing this by power machinery, such as the moving platform, the belt conveyor, the overhead crane and the overhead carrier generally known as the telpher. The many well-known types of fixed or traveling cranes assist in a variety of movements, so that one particular class of freight is handled at vastly less cost than the miscellaneous package freight at the outbound and inbound houses above referred to.

Nearly all manufacturing or industrial plants throughout the country have installed some type or types of power handling machinery where the material is to be handled or conveyed from some one point to some other one point. Many of these mechanical appliances are applicable in the loading and unloading of vessels at wharves and water terminals. They are also, to some extent, useful at railway freight transfer stations where less than car load lots are broken up for the purpose of making car load lots for particular destinations, or the reverse.

Great effort has been made to devise for outbound and inbound freight houses a system of telpherage to embrace lifting, conveying and lowering, say from the time freight is delivered at the doors of the outbound house or teams until it is deposited inside or upon the car; also to make this apparatus workable in handling any kind of package from any one spot in or alongside of the house to any other spot in any car in any part of the yard adjacent to the house. This system involves overhead tracks everywhere in the house and yards sufficient to cover almost every square foot of area, the distribution of contact wires for power, the use of many switches in the track, automatic or otherwise, for diverting of route, etc. When it is tried to lay it out, in connection with existing facilities, it is found, that to get supports for the overhead track this telpherage system practically requires the reconstruction of entire yards and buildings, and that there are often physical obstructions, like overhead bridges, to prevent the utilization of head room over the cars, etc. It has even been said that to make this system most efficient would require the reconstruction of the cars themselves so that they might be loaded through a removable roof or top hatches. These difficulties have prevented railway officers from installing such plants, and there is hardly such a system in the country. Should any manager have sufficient confidence in obtaining the reduction of cost in freight handling by this system the best place to try it out would be in an entirely new terminal where all facilities could be planned to harmonize with this system.

While this mechanical handling discussion has been going on other improvements have been developing, which allow of economy at freight houses by simpler means. Over and over again have railway men repeated the statement that nothing would ever be found to take the place of that wonderful tool, the hand truck, so efficient, in all save expense, in moving the package freight in the freight houses; and a eulogy might be written on its utility as a crow-bar, an elevator (at least sufficiently to clear the floor), a turntable and a conveyor.

The tool now suggested to take the place of the expensive hand truck is nothing more or less than a miniature storage battery power truck, which improvements in batteries and other apparatus have made available for the purpose. The development of this miniature truck is natural, following on the immense success achieved by the recently adopted larger power trucks for baggage handling in New York and other places.

The best features of the miniature truck is its availability in all existing freight houses, and the low cost to any railway to make a test of its efficiency. This machine has been named the "motor dolly," because the timber dolly used on construction work is the smallest known type of machine used for the conveyance of heavy weights. The overall dimensions selected for the motor dolly are those considered most desirable for present outbound freight house conditions. The average working speed will be twice that of the hand truck and the average carrying capacity utilized about three times that of the hand truck. This makes the power dolly, when efficiently used, equivalent to six hand trucks in speed and capacity.

The machine suggested consists of a steel-framed spring mounted platform 6 ft. long and 38 in. wide. The front and rear portions are raised, the rear to accommodate the power plant and driving gear, the front to provide clearance for the steering wheels. The central portion, which is but 9 in. above the floor, is intended for heavy packages, and the raised portions are for light packages. The entire platform area is available for loading. The central or low portion is provided

with a unique and original system of depressable rollers for convenience in loading and unloading. During transit these rollers are depressed, allowing the package to rest directly on the platform. By means of these rollers, large or heavy packages, ordinarily requiring considerable time and labor for loading, may be readily slid on and off the platform, materially facilitating this portion of the work.

The space occupied by the motor dolly is approximately the same as that occupied by a loaded hand truck in transit with the trucker either pushing or pulling the load. The maximum speed practicable is 6 m. p. h., while the average speed will be about 5 m. p. h. The turning radius is 2 ft. at the rear wheels, which allows of its use in as cramped and congested situations as that in which the present hand truck operates. No wider trucking aisles are required than with the hand truck.

The power plant consists of a storage battery in connection with a compact and efficient motor of 2 k. w. rated capacity. As one of the chief requirements is rapidity of movement, or liveliness, a motor capable of considerable overload capacity is required. Similarly, all details of the propelling mechanism should be extremely rugged and capable of rough handling without injury. The battery should be removable, with the idea of recharging batteries independently of the machine; spare batteries should be provided for this purpose. It is considered that under ordinary conditions of operation the battery provided will give about 5 hours' operation without charge, or being recharged. The time required for battery change is about 5 minutes.

The motor is hung on the main frame directly under the battery and is direct-geared to the countershaft through a spur gear reduction. The countershaft runs the width of the machine and is provided with a differential gear. At each end of the countershaft there are sprockets engaging a chain running on sprockets direct connected to the driving wheels. The rear axle is solid, of ample strength and rugged construction.

After providing for the several details comprising the motive power equipment, it will be seen that the space allotted to this purpose is reduced to a minimum. The same may be said of the front portion of the machine. Therefore, any increase in the length of the machine, within reasonable limits, for inbound house conditions would represent net increase of the heavy load portion or low platform section.

The body of the machine is mounted on coil springs, guide pedestals similar to railway car practice being provided. The front wheels are separately pivoted and are operated for steering in the same manner as in automobile practice, except that greater freedom of movement is allowed. The front vertical frame carries the control handles. The removable steering handle is connected through a vertical shaft and suitable reduction to the steering wheels. The automatic controller handle is connected to a compact controller under the front floor, which gives three speeds in both directions. The brake lever works through the usual connections on a brake drum direct connected to the rear wheels. These brakes are of the internal expanding type.

The operator may either stand on the front platform or sit on the folding seat which is hung on the front frame. In case of the front platform being occupied by packages, he can sit on the packages. The automatic controller returns to the off position when released, so that in normal operation it requires small mental effort on the part of the operator to shut off power and apply the brakes. The brake is further provided with means for holding at any position in which it may be placed. It is considered that, in view of the quality of liveliness possessed by this machine, refinement of control is justified.

The maximum capacity is 1,000 lbs., and the weight without load about 1,200 lbs. It is expected that under average conditions the capacity utilized will be about 750 lbs. and the average speed, excluding stops, will be about 5 m. p. h. At the rear of the machine a removable rack or stakes will be provided. These latter may be used as levers in case of necessity to assist in loading.

The motor dolly will readily manoeuver wherever the hand truck will; it can enter the standard freight car and turn around inside if necessary. In general, it represents a compact and lively counterpart of the hand truck with the additional desirable feature of speed, carrying capacity and freedom of movement. No other transportation medium, other than a charging plant, is necessary for the efficient utilization of present freight houses as they now stand, than the installation of this form of transportation in such quantities as is required by the volume of freight handled. The net capacity of the freight house will be increased and the initial investment, operating costs and capital charges will be in direct proportion to the amount of freight handled. This system serves areas and not predetermined fixed points whose locations cannot be changed except at considerable cost.

The entire top surface of the motor dolly can be loaded with freight and its several top surface divisions lend themselves very conveniently to keeping separate the parts of the load that are labeled for separate destinations, either in the cars, or in the house. In order that no freight shall be sent to its wrong destination, pockets are provided for the car numbers, which, instead of being handed to the trucker, are placed in the pocket opposite the freight itself. After the freight is placed in the correct car, the checking numbers are taken from a similar pocket on the car in which the freight is placed and this duplicate number put in the proper pocket on the dolly, so that on the return of the dolly to the loading point the checker may verify the fact that each of the several loads on the dolly has gone to the correct car for destination. This avoids any mixing of cards in the hands of the operator of the dolly.

The use of a motor dolly of this character would probably require in some instances that the facilities for weighing the packages as they come off the team and before they go on the dolly be at the door when the transfer from team to dolly is made. In other cases, where the freight is of one classification, the dolly can go to the scales, as is usual with hand trucks. A portable platform scale could be used at the receiving doors to supplement the usual house scale.

This system of freight handling has been devised by the writer; he has been assisted in the mechanical and other details by B. H. Smith, M. E. Patents have been applied for on this form of apparatus.

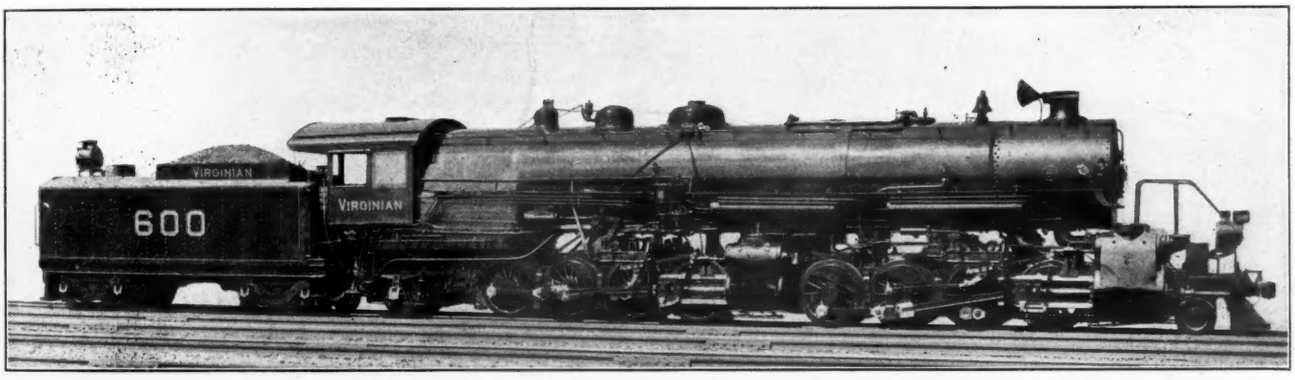
THE TEXAS LEGISLATURE.

The Texas legislature, as recently noticed in this column, has adjourned after a 60-days' session without having passed a single law increasing the restrictions on railway operation and, in fact, without adopting any measure of any kind which will tend to accentuate the hostility toward railways which has been so prominent a feature of public sentiment in that state during the past 15 years. Moreover, the bills called for by the labor unions were uniformly rejected. These bills were numerous, as in former sessions, but not one was enacted into law. One of the bills which proposed to require an additional man on all trains was reported favorably in the lower house but it never came to a vote. John Gould, a Texas newspaper man, who sends us these notes, says that there was encouraging evidence throughout the session of a tendency to give the railways a "new deal," but how much permanency there is to this improvement is difficult to say. While the attitude of the legislature on general laws was thus commendable there were introduced two measures which would encourage railway building in Texas, and which were favored by a strong sentiment among the business community, but which were rejected. These were the bill to allow the consolidation of the Missouri, Kansas & Texas of Texas with the Texan Central, and the bill to repeal the worst features of the law passed last summer for the benefit of unsecured

creditors of the International & Great Northern. The M. K. & T. controls the Texas Central and the T. C. is not a competing line, but the bill failed, even after being favorably reported in both houses. It was reported that the governor meant to veto the bill if it were passed. The I. & G. N. bill is said to have been favored by the governor and it was featured by both committees, but it died of neglect during the last days of the session. Two other consolidation bills failed, one allowing the St. Louis & Southwestern to acquire the Stephenville, North & South Texas Railway, a small western line with which the cotton belt connects, and another permitting the Gulf, Colorado & Santa Fe to take over the Concho & San Saba Valley, another West Texas short line. The original outlook for both of these bills was quite favorable, but both failed in the rush of other business.

LOCOMOTIVE BUILDING DURING 1910; BALDWIN LOCOMOTIVE WORKS.

Locomotive building in the United States during 1910 was characterized by the development of types previously introduced and tried out in service, rather than by the introduction of radically new designs. The year 1909 had witnessed the construction by the Baldwin Locomotive Works of the first Mallet articulated compound locomotives with the 2-8-8-2 wheel arrangement. The first examples of this type were built for the Southern Pacific and were followed later in the year by two similar locomotives for the Atchison, Topeka & Santa Fe. The Santa Fe engines were described in the *Railway Age Gazette* of November 26, 1909, page 1018. They weighed 462,450 lbs. in working order and this weight has not yet been exceeded, unless exception be made in the case of certain ten-coupled locomotives for the same road which were rebuilt as Mallet compounds during the past year by the addition of front units. As the ten-coupled engines had been in service for some time, the rebuilt locomotives can hardly be classed as new construction.



Mallet Locomotive of the 2-8-8-2 Type; Virginian.

MALLET LOCOMOTIVES.

During 1910 the increasing use of the Mallet locomotive was notable, 169 being built by the Baldwin Locomotive Works. These locomotives are now being used to a considerable extent in heavy road service, especially on lines where grades are severe and speeds are necessarily slow. In common with other compound locomotives the Mallet shows its greatest economy at comparatively slow speeds and does its best work on heavy pulls where a high tractive effort is exerted for a maximum period of time.

Virginian Mallets.—The heaviest locomotive built during 1910 was of the 2-8-8-2 type and was constructed for the Virginian. It weighs 448,750 lbs. in working order and develops a tractive effort of 97,200 lbs. It is capable of hauling 20 cars, each weighing 78 tons, and a caboose up a grade of 2.07 per cent. This locomotive is an excellent example of the eight-coupled Mallet, as built by Baldwin, and attention may therefore be called to the principal features of its design. The boiler is of the separable type with the main, or evaporating portion, in the rear section and a feed-water heater in the front section. The separable joint surrounds a combustion chamber which is located between the feed-water heater and the evaporating section. The heater contains ordinary fire tubes except at the center where a large flue, 21 in. in diameter, is located. The injectors force water directly into the heater which is kept filled. The overflow leaves the heater through an outlet placed on the top center line and enters the boiler proper through a check valve so that any discharge from the evaporating section into the heater is impossible.

The throttle is of the usual balanced type and is located in the dome, which is of pressed steel flanged from a single sheet. The steam, in passing from the high to the low pressure cylinders, flows through a nest of small tubes which traverse the central flue of the feed-water heater. It then passes to a flexible receiver pipe which is placed on an angle under the smokebox. With this arrangement the high pressure exhaust steam is reheated and the piping is exposed to the cooling effects of the atmosphere as little as possible. The frames are arranged with a single hinge connection in the form of a cast steel radius bar. The hinge pin is seated at the bottom in a cast steel frame brace, and at the top in the high pressure cylinder saddle. The high pressure cylinders are cast entirely separate from the saddle and from each other. The low pressure cylinders are bolted and keyed to either side of a steel casting secured to the front frame and constitute part of the front frame system. This form of construction makes it possible to keep the transverse distance between the low pressure cylinder centers within reasonable limits, regardless of the distances between frame centers. Eight locomotives similar to the Virginian Mallets and nearly the same capacity, were built in 1910 for the Duluth, Missabe & Northern.

Santa Fe Mallets.—Two Mallet locomotives, with articulated boilers, were built for the Atchison, Topeka & Santa Fe, and were described in the *Railway Age Gazette* of February 24, page 351. They have a 2-6-6-2 wheel arrangement and are alike except for the design of the flexible boiler connection used. On one engine the connection consists of two cast iron sleeves fitted one within the other and provided with snap rings to keep the joint tight. Each sleeve forms a ball joint with a cast iron ring, which is bolted to the shell of the corresponding boiler section. The connection is thus double ball-jointed, as well as slip-jointed, and can accommodate itself to any change in the relative positions of the two boiler sections. On the second locomotive, the articulated boiler connection consists of a number of steel rings which are made with a set, so that when placed adjacent to each other, they form a series of V-shaped sections. These rings are riveted together at their inner edges and bolted at their outer edges, the general arrangement being somewhat similar to the bellows of an accordion. An internal flue traverses the connection and prevents cinders from lodging in the crevices between the flexible plates. The rear section of the boiler contains a superheater and the front section a reheater of the Jacobs type. The front sec-

tion is held in alinement with the frames, but is carried at the rear on a sliding support which provides for expansion and contraction.

The Atchison, Topeka & Santa Fe also received 38 Mallet locomotives generally similar to those described above, but having rigid boilers of the separable type. All the Mallets are fitted for coal burning and are in service on the Belen cut-off, where the maximum grade is 0.6 per cent. On this grade they have handled 2,700 tons of cars and lading at a speed of 15 miles per hour.

In addition to the Mallet locomotives there were built for this road during the past year, 23 Atlantic type locomotives with balanced compound cylinders, and 12 Pacific type locomotives with single expansion cylinders. These engines, in common with the Mallet locomotives, are equipped with the Jacobs-Shupert design of fire-box. This fire-box was described in the *Railway Age Gazette* of November 18, 1910, page 965. The inside and outside shells are each composed of a series of steel plates which are flanged to a channel section and bent to suit the contour of the fire-box. Stayplates, cut out to allow the free circulation of steam and water are interposed between the adjacent channels. As the flanges of the channels composing the inside shell are placed on the water side, the rivet heads are not exposed to the action of the fire. With this construction, staybolts are required in the front and back water legs only.

The Mallet locomotives with rigid boilers, as well as the Atlantic and Pacific type engines, are fitted with superheaters of the Buck-Jacobs type. This form of superheater is built into the boiler shell, and is placed in front of the evaporating section. It consists of a chamber traversed by fire-tubes, around which the steam is compelled to circulate by internal baffle plates. In the Mallet locomotives the superheater is placed in the forward boiler section, and is divided into two parts by an intermediate tube sheet. In the rear part the steam is superheated before it enters the high pressure cylinders, while the front part is used as a reheater between the high and low pressure cylinders. On the compound Atlantic type locomotives, a reheater only is used. All the locomotives equipped with Buck-Jacobs superheaters have two steam domes and the steam pipes are placed outside the boiler so that the joints are readily accessible. These pipes are heavily lagged to prevent radiation.

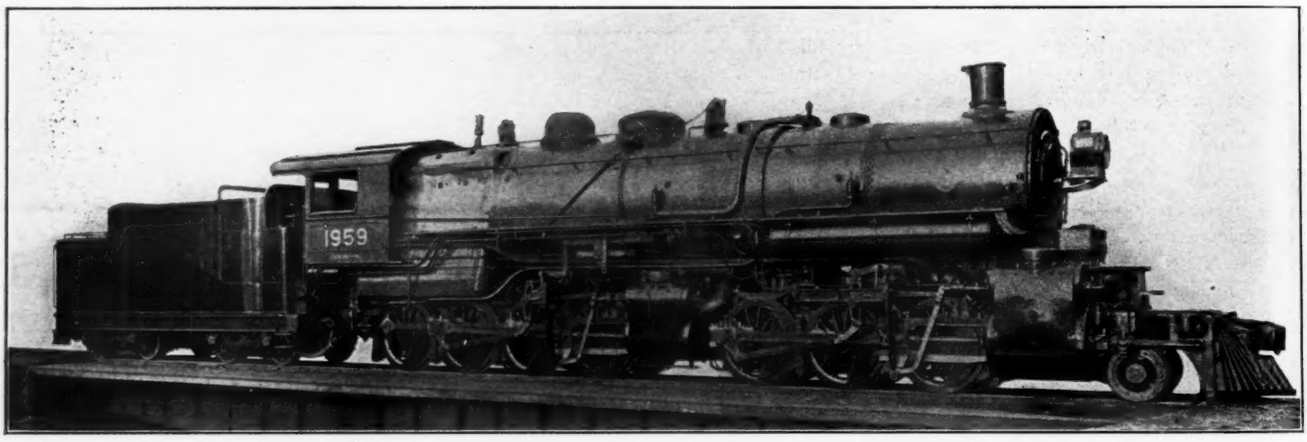
Burlington Mallets.—The Chicago, Burlington & Quincy received ten Mallet locomotives of nearly the same capacity and having the same wheel arrangement as the Santa Fe locomotives. These locomotives were described in the *Railway Age Gazette* of May 13, 1910, page 1213. A fire-tube superheater of the Emerson type, which is also described, is used and the reheater is similar to that applied to the Virginian locomotive. The fuel used is lignite. The boiler is of the separable type, and a feature of the design is the large amount of heating surface (2,172 sq. ft.) provided by the feed-water heater.

Great Northern Mallets.—The first American railway to use the Mallet locomotive on an extensive scale was the Great Northern, which since 1906 has been using locomotives of the 2-6-6-2 type in both road and pushing service. The engines built for this road during 1910 have the 2-6-8-0 wheel arrangement, with a separable boiler and the Emerson superheater. The feed-water heater is traversed by a large central flue, as in the Virginian and Burlington locomotives, but this flue in the Great Northern design contains a single pipe, instead of the nest of small tubes. The surface available for reheating is thus comparatively small but the piping is exposed as little as possible to the cooling effects of the atmosphere.

Mallets for Logging Roads.—During the past year a number of Mallet locomotives were placed in service on logging roads. These engines include a tank locomotive with the 2-6-6-2 wheel arrangement, built for the Booth-Kelly Lumber Company, of Oregon. This locomotive exerts a tractive effort of 37,800 lbs. The line has grades of 6½ per cent. and curves of 35 degs., and is laid with rails weighing 56 lbs. per yard. The engine is an example of a powerful unit designed for service where severe limitations are imposed.

CONVERTED MALLET LOCOMOTIVES.

Forward units for converting single expansion locomotives to Mallet compounds were built for the Erie, the Chicago Great Western and the Atchison, Topeka & Santa Fe. The Erie unit

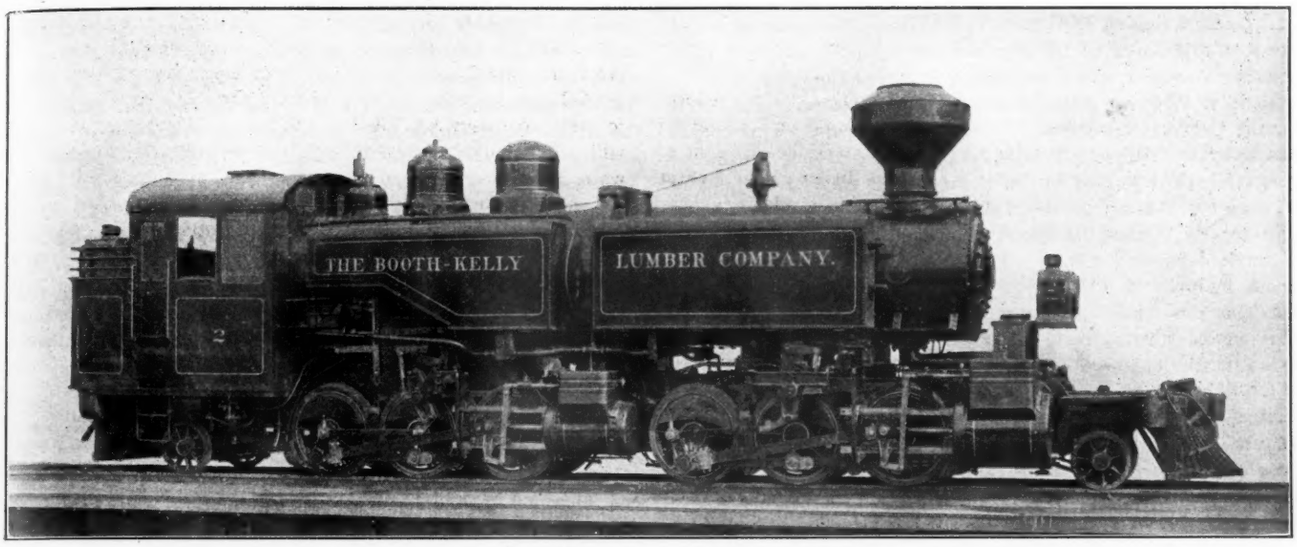


Mallet Locomotive of the 2-6-8-0 Type; Great Northern.

was applied to a consolidation locomotive; the Chicago Great Western units (3 in number) to prairie type locomotives; of the fourteen Santa Fe units, four were applied to consolidation locomotives and ten to engines of the Santa Fe, or 2-10-2 type. The method of converting these locomotives on the Chicago Great Western was described in the *Railway Age Gazette* of November 4, 1910, page 867, and on the Santa Fe, in an article by M. H. Haig, mechanical engineer of that road, published February 10, 1911, page 278. In applying these units comparatively little change is necessary on the original locomotive. The added boiler section is utilized as a feed-water heater, and it has been customary to apply some form of reheater and, in some cases, a superheater. This plan of rebuilding makes it possible to materially increase the power of the locomotive by utilizing energy formerly wasted in exhaust steam, also, the fuel and water consumption per horse power developed is considerably reduced.

SUPERHEATERS.

The development of the single expansion locomotive in both passenger and freight service, has been characterized by the increasing use of superheated steam. The Baldwin Locomotive Works has applied the Vauclain type of smoke-box superheater and various types of fire-tube superheaters principally of the Emerson type. In the case of the Santa Fe locomotives, the superheaters have been built in accordance with designs prepared



Narrow Gage Mallet Locomotive for Logging Service.

by the mechanical officers of that system. On single expansion locomotives equipped with superheaters, it is customary to carry a steam pressure as low as 160 lbs., and to enlarge the cylinders to secure the desired tractive effort. It has been found so difficult to lubricate and maintain slide valves when high temperature steam is used that piston valves are now applied to all locomotives equipped with fire-tube superheaters. With the Vauclain type of smoke-box superheater, which gives a moderate degree of superheat, both piston and balanced slide valves have been successfully used.

Judging from the distribution of locomotives equipped with superheaters, they appear to have met with their greatest success in the middle west, where a large number are employed in both freight and passenger service. Emerson superheaters were applied during 1910 to the Pacific type and consolidation locomotives for the St. Louis & San Francisco, to the Pacific type, Mikado and Mallet locomotives for the Chicago, Burlington & Quincy, and to ten-wheel and Mallet locomotives for the Great Northern.

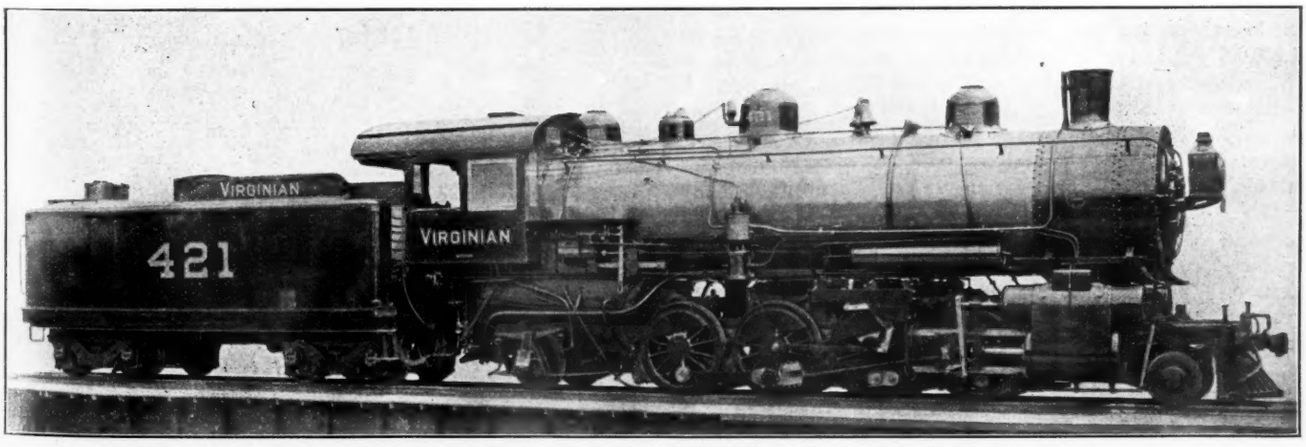
The Great Northern ten-wheel engines are used in passenger service and are of two sizes. The heavier engines have wide fire-boxes with the grates placed above the rear pair of driving wheels. The boilers are built for a pressure of 210 lbs., but in service the safety valves are set at 170 lbs. As the cylinders are 26 in. x 30 in. and the driving wheels 73 in. in diameter, the tractive effort exerted is 40,000 lbs. This is high for a passenger locomotive and indicates the heavy class of service which these engines are required to perform.

MIKADO LOCOMOTIVES.

The original Mikado locomotives were built by the Baldwin Locomotive Works for the Japan Railway Company in 1897. These engines had a gage of 3 ft. 6 in.; they were designed for burning a low grade coal and had wide fireboxes placed over the trailing trucks. Although a decided innovation, they proved most satisfactory in service. The first heavy Mikado locomotives built by the Baldwin Locomotive Works for service in the United States, were completed in 1902 for the Atchison, Topeka & Santa Fe.

A Mikado and a consolidation locomotive may have equal weights on driving wheels and may develop equal tractive efforts, but considerably higher boiler capacity may be provided in the former than in the latter. The Mikado is thus fitted for heavy freight service where speed is an important consideration, or where, because of long grades or other physical conditions, exceptional steaming capacity is required. This wheel arrangement can also be used to advantage in locomotives designed to burn low grade fuel, requiring a deep fire-box with large grate area. It has also been applied with excellent results, to eight-coupled locomotives for logging or other special service, where it is frequently necessary to back into sharp curves and switches.

The Virginian has purchased 42 locomotives of this type for heavy service from the Baldwin Locomotive Works during the past two years. These engines are handling coal traffic on a section of the line where the grades are generally favorable to the movement of loaded trains. They exert a tractive effort of 50,000 lbs., and one of them has hauled, in a single train, 100

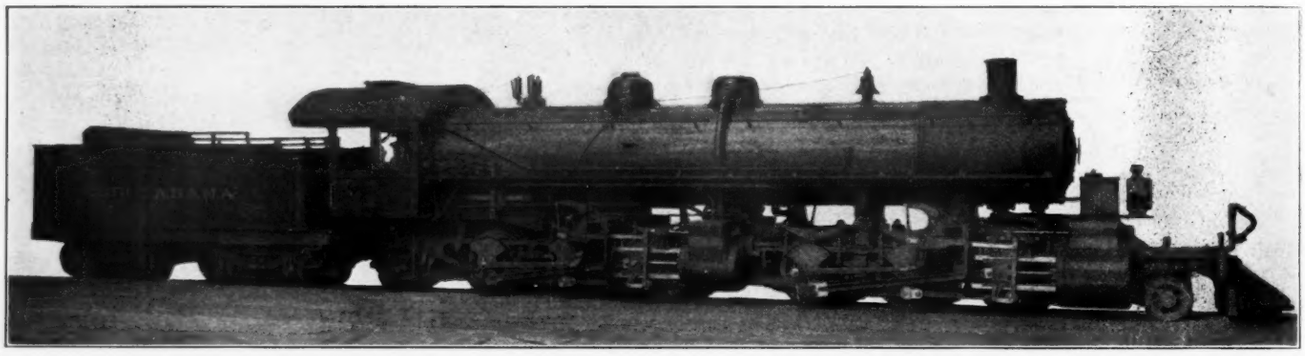


Mikado Locomotive for Heavy Freight Service; Virginian.

loaded cars weighing 7,562 tons. These locomotives use saturated steam at a pressure of 180 lbs., and are equipped with the Walschaert valve gear and pneumatic power reversing gear.

In July, 1910, an experimental Mikado locomotive was built for the Oregon Railroad and Navigation Company. This engine was specially equipped for burning lignite and has proved so successful, as described in the *Railway Age Gazette* of January 27, page 167, that a number of similar locomotives are now being built for the Associated Lines. The boiler has a wide fire-box of ample depth and volume and the smoke-box is of exceptional length in order to provide sufficient netting area. The design embodies the Associated Lines standards wherever practicable. This engine steams freely when using a large nozzle and very little difficulty has been experienced from spark throwing in spite of the light character of the fuel.

Another notable order for Mikado locomotives was received from the Chicago, Burlington & Quincy and partly filled before the close of the year. This order called for 50 engines, all of which have fire-tube superheaters of the Emerson type. These are among the heaviest eight-coupled single expansion locomotives thus far built and their driving-wheels, which are 64 in. in diameter, are among the largest thus far applied by the builders to an eight-coupled engine. With 27 in. x 32 in. cylinders and a boiler pressure of 170 lbs., the tractive effort exerted is 49,300 lbs. The superheater contributes a heating surface of 845 sq. ft. and the superheater pipes are placed in 24 tubes 5½ in. in diameter. The steam distribution is controlled by 14 in. piston valves and Walschaert valve gear. The high tractive effort and steaming capacity of these locomotives, together with the large driving wheels used, make the design specially suitable for heavy road service where speed is an element of consideration.



Narrow Gage Mallet Locomotive with Outside Frames.

CONSOLIDATION AND TWELVE-WHEEL LOCOMOTIVES.

For general freight service there continues a demand for consolidation locomotives. These engines have shown a steady advance in size and capacity, and the total weight of a consolidation locomotive for trunk line service is now usually in excess of 200,000 lbs. and cylinders with a diameter of 23 in. or 24 in. are becoming common on engines carrying 200 lbs. pressure. A modification of the consolidation type is the twelve-wheel, which has a four-wheel leading truck but no trailing truck. Locomotives of this type, weighing 113,000 lbs., were built by the Baldwin Locomotive Works for the Lehigh Valley as far back as 1887, to specifications furnished by James Weaver, master mechanic. Forty locomotives with this wheel arrangement, weighing 261,000 lbs. each, were built in 1910 for the Norfolk & Western. These engines use saturated steam at 200 lbs. pressure and the distribution is controlled by piston valves. The locomotives were built to drawings furnished by that railway.

PASSENGER LOCOMOTIVES.

The majority of passenger locomotives built during 1910 were of the six-coupled type having either the 4-6-0 or 4-6-2 wheel arrangement. Locomotives with three pairs of driving wheels are becoming more and more of a necessity in express passenger traffic because of constantly increasing train loads and more exacting requirements of service. The largest order for four-coupled passenger locomotives filled during the year was from the Baltimore & Ohio for 26 Atlantic type locomotives. These engines were described in the *Railway Age Gazette* of May 20, 1910, page 1255. They use saturated steam at a pressure of 205 lbs., and with 22 in. x 26 in. cylinders and driving wheels 80 in. in diameter, the tractive effort exerted is 27,400 lbs. The boiler design is characterized by a large grate, having an area of 55.5 sq. ft., and a moderate amount of well-disposed heating surface (2,350 sq. ft.). The steam distribution is controlled by 14 in. piston valves and Walschaert valve-gear. The tender is equipped with a water scoop operated by compressed air.

Balanced Atlantic type locomotives for the Santa Fe were described in the *Railway Age Gazette* of December 23, page 1189. They have two high pressure cylinders between the frames and two low pressure cylinders outside. All four pistons are connected to the leading pair of driving-wheels and the steam distribution is controlled, on each side, by a single piston valve. Since their introduction on the Santa Fe in 1903, they have been highly successful and some of them have made remarkable mileage records. One engine, received from the builders on May 1, 1906, was in service until October 22, 1910, without being shopped for general repairs, during which time it covered 241,335 miles.

MISCELLANEOUS DETAILS.

Trailing Trucks.—The locomotive designs during the past year present comparatively few details that are radically new. An increasing use of outside journal trailing trucks is to be noted on all types of engines to which such trucks are applied. A large number of locomotives have been equipped with the Hodges truck, which is simple in construction and may be clamped to the engine frames if it is desired to prevent side swing. This truck is provided with leaf springs which are mounted directly over the boxes and the side swing is taken by the spring links which are jointed for the purpose. Several of these trucks have also been equipped with centering springs.

Piston and By-Pass Valves.—With the increasing use of piston valves there has been a steady improvement in the design, not only of such valves but also of the cylinder castings and their accessories. A by-pass valve is an important feature on a piston valve cylinder and the form of by-pass valve generally used by the Baldwin Locomotive Works is one which has been extensively used on the Pennsylvania Railroad. The live steam ports are extended upward to a horizontal face placed above the steam chest and are normally covered by a flat plate, which is held to its seat by steam pressure acting on its upper surface. Excessive pressure beneath the plate will cause it to lift from its seat thus opening communication between the two ends of the cylinder. This style of by-pass has been applied not only to single expansion locomotives but also to Mallet compounds on which piston valves are used.

Walschaert Valve Gear.—The majority of the standard gage road engines built during 1910 were equipped with Walschaert valve gear. This gear has been simplified and materially strengthened, special attention having been given to the structural parts which support the motion work. As far as possible, all moving parts are located in the same vertical plane. Where this cannot be done it is customary to attach the upper end of the combining lever either to a rocker or to a crosshead having offset lugs so that the movement is transferred from the plane of the combining lever to that of the valve stem.

Wheels.—Many of the locomotives built in 1910 were equipped with solid forged and rolled steel truck wheels. In some cases these wheels were used under the tender only, the steel tired wheels being used on the engine truck. Rolled steel wheels are moderate in cost, and their durability and freedom from breakage makes them specially suitable for service under heavy motive power and rolling stock.

LOCOMOTIVES FOR EXPORT.

The locomotives built for export during the year included two of the Pacific type for the Central Railroad of Brazil, which are the largest passenger engines thus far shipped by these builders to South America. These locomotives have a gage of 5 ft. 3 in., and are equipped with fire-tube superheaters of the Emerson type. They exert a tractive effort of 29,000 lbs., and weigh in working order 189,100 lbs. The fuel used is Cardiff coal. At the International Exhibition of Railway and Land Transport, held at Buenos Aires, the Baldwin Locomotive Works exhibited three locomotives: a wood burning Mallet articulated compound for the Sorocabana Railway, Brazil; a ten-wheel passenger locomotive for the Entre Rios Railway, Argentine, and a consolidation freight locomotive for the same road. The Mallet locomotive has the 2-6-6-2 wheel arrangement, and is built for meter gage track. The tractive effort exerted is 33,800 lbs., and the total weight of the locomotive is 190,800 lbs. Because of the large size of the boiler and the narrowness of the gage, the frames are placed outside the wheels in order that ample stability may be secured. The power reverse mechanism is operated by steam and a steam brake is applied to the driving wheels with separate cylinders for the front and back groups. The automatic vacuum brake with train connections front and back, is applied to the tender wheels. The locomotives for the Entre Rios are designed for standard gage track, and are generally similar to each other, with interchangeable details where practicable. Both engines are equipped with smoke box superheaters of the Vauclain type. The steam distribution is controlled by balanced slide valves, driven by the Walschaert valve gear.

TENDENCIES IN DESIGN.

The output for 1910, considered as a whole, shows that steady progress has been made in augmenting the capacity and efficiency of American locomotives. On the principal roads the reconstruction of tracks and bridges during recent years has made possible a marked increase in the weight limit per pair of driving wheels. This limit, on the majority of trunk lines, is now between 50,000 and 60,000 lbs. and the tractive effort of 8-coupled locomotives with this wheel loading is sufficient on low grade lines for one engine to handle the maximum tonnage practicable in a single train. On mountain sections Mallet locomotives are effecting economies in operation and their use has resulted in a corresponding increase in the tonnage handled per train. A study of the motive power built in 1910 and of the present operating conditions on American railways leads to the conclusion that in the immediate future locomotive development will be characterized by an increasing efficiency and an improvement of details, together with the adoption of locomotives of the maximum weights permissible.

The government of Jamaica now operates 184 miles of railway. Of these 120 miles were built by American syndicates.

CONCRETE FOR RAILWAY WORK.*

It may not be amiss to give a partial list of railway structures to which concrete and reinforced concrete have been applied. This list can probably be added to considerably, but it will at least serve as a starting point and give some indication of the extent of concrete usages to date, and perhaps suggest other applications of this most adaptable material.

TYPES OF RAILWAY STRUCTURES ALREADY BUILT OF CONCRETE.

- Ash Handling Plants
- Ash Pits
- Benches
- Bridges
  - Abutments
  - Arches
  - Cattle Passes
  - Culverts
  - Foot
  - Floors
  - Girders
  - Highway
  - Piers
  - Raising grade of old abutments and piers
  - Track Elevation
  - Trestles
  - Viaducts
- Bumping Posts
- Caissons
- Cattle Guards
- Chimneys
- Cisterns
- Coal Breakers
- Coal Stations
- Coal Trestles
- Curbs
- Depots
  - Coal
  - Freight
  - Passenger
- Docks
  - Coal
  - Ore
  - Terminal
- Drain Tile
- Driveways
- Ducts
- Dwellings
- Fences
  - Right of Way
  - Ornamental
- Filter Plants
- Flower Boxes
- Foundations
- Grain Elevators
- Houses
  - Crossing Tender
  - Clipping
  - Cleaning
  - Milk
  - Oil
  - Section
  - Switch
  - Station
  - Sand
  - Superintendent
  - Storage
  - Transfer
  - Y. M. C. A.
- Man Holes
- Mile Posts
- Offices
- Paths
- Pattern Shops
- Pavements
- Piles
- Piers
- Platforms
  - Freight
  - Passenger
  - Shipping
- Poles
  - Light
  - Power Transmission
  - Telegraph
  - Tickler
- Posts
  - Fence
  - Bumping
  - Signal
- Power Stations
- Reservoirs
  - Oil
  - Water
- Retaining Wall
  - Gravity
  - Reinforced Concrete
- Road Bed
- Round Houses
- Signal Stands
- Signal Towers
- Shops—all kinds
- Stairs
- Stations
  - Passenger
  - Freight
- Stock Yards
- Telegraph Pole Butts
- Tanks
  - Grain
  - Oil
  - Sand
  - Water
- Terminal Buildings—all kinds
- Ties
- Toilets
- Train Sheds
- Trenches
  - Linings
  - Pipe
  - Wire
  - Troughs
  - Drinking
  - Feeding
- Tunnel Linings
- Turn Table Pits
- Trestles
  - Coal
  - Ore
  - Sand
  - Stone
- Vaults
- Walks
- Warehouses—all kinds
- Water Closets

Structurally, reinforced concrete buildings meet most tests in a reasonable manner. It has been stated on high authority that more is known of the strength of reinforced concrete columns and other members than is actually known of steel work. More laboratory study has been spent and more tests have been made on concrete than on the other material and the design of reinforced concrete rests on a sane and high standard, which, although varying in many details, is fairly uniform the country over.

Briefly, the points in which concrete offers better results than other materials are, rigidly, load carrying capacity, elimination of maintenance and depreciation charges, sanitary qualities, fire proofness, water proofness and cost.

The rigidity of a concrete building under moving or vibrating loads is apparent from the manner in which reinforced concrete bridge decks have given service under train loads. The shock and vibration sustained by a relatively thin concrete floor on a plate girder bridge under a fast train probably exceeds anything likely to occur in any building. As a matter of fact, concrete factory buildings this country over, furnish positive testi-

* Abstract of a copyrighted paper by J. P. H. Perry, Turner Construction Company, New York, presented before the New York Railroad Club, April 21.

mony as to the ability of this material to withstand vibratory stress in a satisfactory manner. In numerous instances this form of building construction has been accepted over others solely because of its rigidity and practical elimination of vibration. The value of a stiff building is chiefly apparent in the cost of operating the machinery contained therein. If shafting can be lined up, machines set in place and leveled up and maintained as first installed without variation, the repairs and maintenance charges are considerably reduced, as are also the attendance, oil, and new bearings, items of the annual up-keep of a plant.

Concrete buildings are built on a larger actual safety factor than are most other types of buildings. This is due largely to the fact that ordinarily no allowance is made in the design of a floor of concrete for continuous action and the theoretical safety factor is much less than the actual one. The owner finds that he can load his building pretty much as he pleases. It is difficult to conceive of any depreciation on a properly designed and erected concrete building, that is, structural depreciation. As far as decrease in the serviceability of the building for its originally designed usage, aside perhaps from an allowance of one-quarter of 1 per cent. per year to cover windows, doors, roofings and similar details, there is none. Painting alone will often in a few years more than eat up the difference in first cost between a concrete structure and one of steel or wood. Concrete is known to increase in its strength. It is fairly generally admitted by the engineering world that the reinforcement is amply protected.

A recent canvass of some 255 owners of concrete industrial buildings showed that 27 per cent. of the owners carry *no fire insurance* on their buildings, and that an almost equally large number more would not pay any premiums were it not because of mortgages or loans.

The sanitary qualities offered by a concrete building are due in one way to the cement being a lime product and naturally hygienic. Furthermore, the method of constructing reinforced concrete prohibts the presence of vermin and permits of maximum window area, and consequent maximum light with a subsequent reduction in unsanitary corners of darkness and probable dirt or filth. Dampness is unknown in reinforced concrete buildings. This statement possibly sounds startling and perhaps even untrue to some, but it is a fact. There is probably no more common prejudice against reinforced concrete buildings than that they are damp. This idea undoubtedly originated in the experience of so many summer cottage or bungalow owners, whose dwellings were constructed of concrete blocks. Such edifices unquestionably are damp. But with reinforced concrete construction there is a surplus of water at the time of depositing the concrete and instead of the cement having to absorb moisture from the atmosphere to complete its crystalization, it gives off during the finishing of the building such water as it does not need, and this results in the finished structure being a building impervious to moisture, and furthermore, a building which, owing to the low conductivity of the component material, is even temperatured as well. None of the reinforced concrete factories or warehouses within the writer's experience, and he knows personally over 200 such structures, is damp-proofed in any way above the basement.

Although concrete floors with granolithic finish placed monolithic are generally considered waterproof, they are seldom strictly so. Small shrinkage cracks are liable to develop and their existence makes probable some damage below if the floor is flooded. Concrete structural slabs covered with cinder fill and maple flooring laid on sleepers are not much, if any, better, as water goes through the wooden floor and through the porous cinder fill between the sleepers. Recently, however, a form of granolithic finished floor has been built, which seems to be practically waterproof, and has been accepted by the board of underwriters as satisfactory. The granolithic finish is not placed monolithic with the structural concrete, but is laid 1 in. thick on top of a 2 in. rich cinder concrete bed, which is placed on the slab proper. This gives ordinarily 7 in. of concrete for water to find its way through—the three strata, placed at different times and of different mixtures, seem to eliminate shrinkage cracks extending entirely through the floor. At any rate, on one floor test 22,500 sq. ft. of surface was flooded to a mean depth of three inches and maintained in that condition some 48 hours. The total leakage amounted to about five gallons and no leakage whatsoever occurred until five hours had elapsed. The cost of placing finish in this manner is but little higher than as conventionally laid.

As regards cost, reinforced concrete buildings vary from a very slightly higher cost to about 20 per cent. less cost than structural steel fire proofed, and will run generally from equal, or, in very large undertakings, a trifle less cost than first-class mill construction, to an excess cost of as much, occasionally, as 25 per cent. or 30 per cent. These figures may be considered a fair average. Where building codes do not unduly restrain the design, concrete skeleton frames are fast replacing steel cages for buildings not exceeding eight stories in height. Especially is this true of industrial buildings which differ but little, if any, from the ordinary railway shop, warehouse, terminal store, or office structure. It is safe to state that a reinforced concrete building, approximately square in shape, with floor area from 8,000 up to 20,000 sq. ft. per floor, with a height of from 5 to 10 stories (story heights 12 ft. to 13 ft. floor to floor), with maximum window area on all sides protected with hollow metal window frames and sash and glazed with wire glass, with stair and elevator wells enclosed in fireproof partitions, cut off with automatic fire doors, with board of fire underwriters equipment throughout, with the exception of a sprinkler system, will cost a sum not exceeding 10 cents per cubic foot of contents, equal to $1.25 per square foot of floor space. This figure includes a building complete with elevators, plumbing, electric wiring and steam heating. There is no other form of fireproof construction which can equal this proposition.

Certainly, warehouses, pattern shops, terminal stores, large station buildings, freight houses, express depots, round houses and office buildings come within a class of structure to which concrete might be economically adopted. At least competitive figures should be taken on plans. Almost any concrete contractor is capable of bidding upon a set of blue prints which may call for either mill construction or steel frame work.

The effect of oils on concrete has been a subject of considerable discussion, and the best information on this point has come largely from railway engineers. The Chicago, Milwaukee & St. Paul men made extensive studies of the effect of signal and machine oils on concrete semaphore pedestals, switch stands, oil store house floors, bridge decks, etc., and found that mineral oils do not damage. Other investigations have found that vegetable oils may or may not harm concrete, depending somewhat upon whether or not the oils are the so-called drying kind, such as linseed, which probably have no bad effect, or one of the non-drying class, such as cotton seed, olive and castor, which it is thought do injure concrete. Animal fats and oils are also destructive. There is much positive evidence on record, however, to show that mineral oils do no harm.

Locomotive smoke and gases also apparently do not hurt concrete. Several roundhouses have been built in the western portion of the country, and, as far as is known, have given entire satisfaction. Concrete bridges, and concrete protection around steel bridges, seem to be impervious to injury from this source.

As to the protection afforded by concrete to reinforcement, the *Engineering News* recently recorded the demolishing of a seven-story reinforced concrete office and publishing building in Baltimore. This building was nearly seven years old when it had to be wrecked to make way for an 18-story loft building. The testimony is to the effect that the reinforcing bars were found to be in perfect condition. The writer knows of a case of the removal of some seven year old concrete footings, which were below mean low water on Staten Island, N. Y. The reinforcement, though at some points protected by but three-quarters of an inch of concrete, was as bright as the day it was put in place.

There is a super-abundance of evidence of this kind and it may be accepted that reinforced concrete construction need not be feared on this score.

It is claimed that installing piping, shafting, motors and other machinery is very difficult in a concrete building after it has been once erected. As a matter of fact, an investigation of concrete buildings occupied for industrial purposes will show that making changes in mechanical equipment is not considered a problem difficult to solve. The writer visited some 50 factory buildings and was surprised to find the ease with which mechanical engineers or factory superintendents made their changes and made provisions for the supporting of their pipes, etc., from concrete ceiling or on concrete floors or walls.

Railway buildings other than warehouses, shops and factories, are confined chiefly to stations. Several very successful structures of this kind already exist, and offer themselves as an advance guard of what seems likely to become a very large class of concrete buildings. The Sante Fe, the Canadian Pacific and the Lackawanna have been leaders in this special field, and can show excellent work. The permanency and the low cost—for a fireproof structure—combined with a satisfactory exterior appearance, which has no maintenance charges to be provided for, make concrete stations, switch houses, and signal towers good investments.

Summing up the use of concrete for railway work the chief thought would seem to be that only a very few of the railways in this country have adopted concrete to the extent to which it so readily lends itself, and that it might profit them to use it more freely. With the magnificent future before this country and the great growth which inevitably must take place it is almost criminal to build non-fireproof or temporary structures. The fire loss of $2.30 per capita in the United States as against a mean loss of $0.30 in seven European capitals stands forth as a blot on the commercial reputation of the land.

REPORT ON CONDITION OF TREATED TIES ON GULF, COLORADO & SANTA FE.

The Bureau of Forestry of the United States Department of Agriculture, in co-operation with the Santa Fe and several other railways, laid a section of experimental track about 2½ miles long on the Beaumont division of the Gulf, Colorado & Santa Fe in 1902. A complete description of the installation is given in Bulletin No. 51 of the Bureau of Forestry, and a report of the inspections of the track up to September, 1909, is included in the proceedings of the American Railway Engineering Association, Vol. 11, Part 2. This locality was selected for this test because of its extreme weather conditions. During a number of months in each year the temperature is very high and rainfall extremely heavy, and it was thought that these conditions would hasten the determination of the life of treated ties. The ties were furnished by railways, and were taken out of stock, being of grades that were easily obtained. For this reason, the test does not cover all grades of lumber that are used for ties, and since little care was used in selecting sound timbers, many of them have shown a short life in the track, on account of defects in the timber or in its seasoning.

The ties were treated without charge by preserving companies, and, on account of the small number of ties of each grade, they were in some cases grouped in the process of treating, so that in many instances the ties did not receive the treatment best adapted to them. All ties of the same wood were laid together, so that practically the same conditions exist for all. Each tie was marked with nails showing the kind of timber, the kind of treatment and the year in which it was laid. The track was heavily ballasted between the rails with densely packed sand and the ends of ties were left exposed. There is a continuous stretch of pine forest on both sides of the track, by which it is

Table I—Record of Life of Ties in Experimental Track on the Beaumont Division of the Gulf, Colorado & Santa Fe.

Kind of Wood.	No. of Ties.	Kind of Treatment.	Year inserted.	Nov., 1903. No.	%	June, 1904. No.	%	Nov., 1905. No.	%	Dec., 1906. No.	%	Feb., 1908. No.	%	Nov., 1908. No.	%	Sept., 1909. No.	%	Feb., 1911. No.	%	Ties still in track. Number. Good.	Decay.	%
White Oak	196	Untreated	May, 1902	..	..	1	0.5	..	..	..	..	146	75	..	..	..	..	..	..	25	24	25
" "	100	Burnett—Chicago	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	64	64	36	0	36
" "	101	Wellhouse—Chicago	"	..	..	..	..	..	..	..	..	3	3	2	5	..	..	..	..	80	16	95
" "	107	Zinc-creosoted—Beaumont	"	45	42	36	75.7	26	100	..	..	..	..	..	..	..	..	..	..	0	0	0
" "	100	Burnett—T.T.&L.P. Co., Somerville	"	..	..	..	..	..	..	..	..	17	17	1	18	82	100	..	..	0	0	0
" "	100	Wellhouse " "	"	..	..	..	..	..	..	..	..	..	..	42	42	..	..	..	..	46	12	58
" "	100	Allardyce " "	"	..	..	..	..	..	..	..	..	..	..	1	1	1	2	69	71	29	0	29
" "	196	Hassellman " "	"	..	..	..	..	2	1	22	12.2	140	83.7	..	..	..	..	..	..	17	15	16
Red Oak	93	Untreated	Mar., 1902	..	..	5	5.4	77	88.2	..	..	..	..	5	93.5	..	..	6	100	0	0	0
" "	86	Burnett—Chicago	"	..	..	..	..	..	..	..	..	..	..	..	..	3	3.5	21	28	28	34	72
" "	20	Burnett—T.T.&L.P. Co., Somerville	"	..	..	..	..	..	..	..	..	..	..	..	..	20	100	..	..	0	0	0
" "	20	Wellhouse " "	"	..	..	..	..	..	..	..	..	..	..	..	..	20	100	..	..	0	0	0
" "	10	Allardyce " "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	0	100
" "	19	Hassellman " "	"	..	..	..	..	15	78.9	2	89.5	..	..	2	100	..	..	..	..	0	0	0
Black Oak	24	Untreated	May, 1902	..	..	..	..	3	12.5	19	91.7	2	100	..	..	..	..	..	..	0	0	0
" "	86	Wellhouse—Chicago	"	..	..	..	..	..	..	..	..	12	14	2	16.3	..	..	10	28	37	25	72
" "	76	Zinc-creosoted—Beaumont	"	36	47.4	40	100	..	..	..	..	..	..	..	..	..	..	..	..	0	0	0
" "	34	Burnett—T.T.&L.P. Co., Somerville	"	..	..	..	..	..	..	..	..	5	14.7	..	..	..	..	29	100	0	0	0
" "	33	Wellhouse " "	"	..	..	..	..	..	..	..	..	2	6	16	54.5	..	..	11	88	0	4	12
" "	60	Allardyce " "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	46	77	14	0	23
" "	118	Hassellman " "	"	..	..	..	..	104	88.1	4	91.5	3	94.1	7	100	..	..	..	..	0	0	0
Turkey Oak	20	Untreated	April, 1902	..	..	..	..	..	..	18	90	..	..	..	..	2	100	..	..	0	0	0
" "	10	Zinc-creosoted—Beaumont	"	..	..	..	..	10	100	..	..	..	..	..	..	..	..	..	..	0	0	0
" "	19	Burnett—T.T.&L.P. Co., Somerville	"	..	..	..	..	..	..	..	..	..	..	..	..	19	100	..	..	0	0	0
" "	20	Wellhouse " "	"	..	..	..	..	..	..	..	..	..	..	..	..	18	90	..	..	2	0	10
" "	10	Allardyce " "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8	2	100
" "	19	Hassellman " "	"	..	..	..	..	18	94.7	1	100	..	..	..	..	..	..	..	..	0	0	0
Spanish Oak	20	Untreated	May, 1902	..	..	..	..	4	20	..	..	16	100	..	..	..	..	..	..	0	0	0
" "	10	Zinc-creosoted—Beaumont	"	..	..	..	..	8	80	..	..	..	..	..	..	..	..	..	..	2	0	20
" "	21	Burnett—T.T.&L.P. Co., Somerville	"	..	..	..	..	..	..	..	..	5	23.8	..	..	..	..	4	43	8	4	57
" "	20	Wellhouse " "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	9	45	10	1	55
" "	10	Allardyce " "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	50	5	0	50
" "	20	Hassellman " "	"	..	..	..	..	1	5	8	45	11	100	..	..	..	..	..	..	0	0	0
Willow Oak	20	Untreated	May, 1902	..	..	..	..	15	75	5	100	..	..	..	..	..	..	..	..	0	0	0
" "	11	Zinc-creosoted—Beaumont	"	..	..	..	..	11	100	..	..	..	..	..	..	..	..	..	..	0	0	0
" "	20	Burnett—T.T.&L.P. Co., Somerville	"	..	..	..	..	..	..	..	..	..	..	..	..	20	100	..	..	0	0	0
" "	20	Wellhouse " "	"	..	..	..	..	..	..	..	..	..	..	8	40	..	..	12	100	0	0	0
" "	10	Allardyce " "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	100	0	0	0
" "	20	Hassellman " "	"	..	..	..	..	17	85	3	100	..	..	..	..	..	..	..	..	0	0	0
Beech	100	Untreated	Feb., 1902	..	..	..	..	97	97	3	100	..	..	..	..	..	..	..	..	0	0	0
"	50	Zinc-creosoted—Beaumont	"	..	..	..	..	..	..	..	..	50	100	..	..	..	..	..	..	0	0	0
"	99	Burnett—Chicago	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	75	76	23	1	24
"	100	Wellhouse—Chicago	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	84	16	100
"	50	Allardyce—T.T.&L.P. Co., Somerville	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	40	80	10	0	20
"	98	Hassellman " "	"	..	..	2	2	96	100	..	..	..	..	..	..	..	..	..	..	0	0	0
Hemlock	101	Untreated	April, 1902	..	..	101	100	..	..	..	..	..	..	..	..	..	..	..	..	0	0	0
"	49	Zinc-creosoted—Beaumont	"	..	..	..	..	..	..	38	77.6	..	..	4	85.7	..	..	1	88	6	0	12
"	100	Burnett—Chicago	"	..	..	..	..	..	..	..	..	..	..	30	30	..	..	..	..	24	46	70
"	100	Wellhouse—Chicago	"	..	..	..	..	..	..	..	..	..	..	..	..	4	4	17	21	56	23	79
"	50	Allardyce—T.T.&L.P. Co., Somerville	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	50	100	0	0	0
"	100	Hassellman " "	"	..	..	..	..	87	87	7	94	..	..	6	100	..	..	..	..	0	0	0

Table I—Record of Life of Ties in Experimental Track on the Beaumont Division of the Gulf, Colorado & Santa Fe—(Continued).

Kind of Wood.	No. of Ties.	Kind of Treatment.	Year inserted.	Nov., 1903. No.	%	June, 1904. No.	%	Nov., 1905. No.	%	Dec., 1906. No.	%	Feb., 1908. No.	%	Nov., 1908. No.	%	Sept., 1909. No.	%	Feb., 1911. No.	%	Ties still in track. Number. Good.	Decay.	%
Tamarack	49	Untreated	May, 1902	..	..	..	..	49	100	..	..	..	..	..	..	..	..	..	..	0	0	0
"	51	Zinc-creosoted—Beaumont	"	..	..	..	..	..	..	..	..	..	..	..	..	46	90.2	..	..	5	0	10
"	49	Burnett—Chicago	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	34	15	100
"	100	Wellhouse—Chicago	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	84	16	100
"	50	Allardyce—T.T.&L.P. Co., Somerville	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	50	100	0	0	0
"	98	Hassellman " "	"	..	..	..	..	78	79.6	..	..	11	90.8	..	..	..	..	9	100	0	0	0
Shortleaf Pine	100	Untreated	May, 1902	..	..	35	35	20	55	44	99	..	..	..	..	..	..	1	100	0	0	0
"	50	Zinc-creosoted—Beaumont	"	..	..	..	..	..	..	..	..	..	..	43	86	..	..	..	..	4	3	14
"	100	Burnett—T.T.&L.P. Co., Somerville	"	..	..	..	..	..	..	..	..	..	..	61	61	..	..	1	62	22	16	38
"	100	Wellhouse " "	"	..	..	..	..	..	..	..	..	..	..	79	79	..	..	..	..	13	8	21
"	50	Allardyce " "	"	..	..	..	..	..	..	..	..	..	..	21	42	1	44	..	..	14	14	56
"	98	Hassellman " "	"	..	..	..	..	..	..	74	75.5	..	..	23	99	..	..	..	..	0	1	1
Redheart Pine	100	Hassellman " "	"	..	..	..	..	25	25	49	74	3	77	23	100	..	..	..	..	0	0	0
Longleaf Pine	93	Untreated	April, 1902	..	..	..	..	85	91.4	..	..	..	..	1	92.5	..	..	7	100	0	0	0
"	50	Zinc-creosoted—Beaumont	"	..	..	..	..	..	..	..	..	19	38	1	40	..	..	..	..	22	8	60
"	100	Burnett—T.T.&L.P. Co., Somerville	"	..	..	..	..	..	..	..	..	27	27	..	..	..	..	..	..	51	22	73
"	100	Wellhouse " "	"	..	..	..	..	..	..	..	..	3	5	52	55	..	..	..	..	28	17	45
"	100	Hassellman " "	"	..	..	..	..	..	..	..	..	95	95	..	..	..	..	..	..	3	2	5
"	50	Allardyce " "	"	..	..	..	..	..	..	..	..	7	14	..	..	..	..	..	..	30	13	86
"	100	Beaumont Oil " "	"	..	..	..	..	..	..	70	70	..	..	..	..	..	..	30	100	0	0	0
"	100	Beaumont Oil-Zinc Chlo.	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8	8	81	11	92
"	100	Spirittine—T.T.&L.P. Co., Somerville	"	..	..	..	..	..	..	8	8	72	80	..	..	..	..	5	85	12	3	15
Loblolly Pine	100	Untreated	April, 1902	..	..	100	100	..	..	..	..	..	..	..	..	..	..	..	..	0	0	0
" " (a)	49	Zinc-creosoted—Beaumont	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	49	100	0	0	0
" " (d)	99	Burnett—T.T.&L.P. Co., Somerville	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	99	100	0	0	0
" " (c)	99	Wellhouse " "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	94	95	4	1	5
" " (b)	49	Allardyce " "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	49	100	0	0	0
" "	99	Hassellman " "	"	..	..	..	..	18	18.2	81	100	..	..	..	..	..	..	..	..	0	0	0
" "	42	Beaumont Oil " "	"	..	..	..	..	40	95.2	..	..	..	..	..	..	..	..	2	100	0	0	0
" "	80	Beaumont Oil-Zinc Chlo.	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	80	100	0	0	0
" "	100	Spirittine—T.T.&L.P. Co., Somerville	"	..	..	..	..	80	80	18	98	..	..	..	..	..	..	2	100	0	0	0
Pines	84	Avenarius Carbolineum	April, 1905	..	..	..	..	..	..	1	1.2	76	91.7	..	..	..	..	..	..	..	..	..
"	19	Diamond Glue Private	Feb., 1902	..	..	..	..	17	89.5	..	..	2	100	..	..	..	..	..	..	0	0	0
"	74	Hassellman	"	..	..	..	..	33	44.6	37	94.6	..	..	..	..	1	95.0	1	97.3	2	0	2.7
Cal. Redwood	8	Burnett	"	..	..	..	..	8	100	..	..	..	..	..	..	..	..	..	..	0	0	0
" "	2	Burnett-Cal. Crude Oil	"	..	..	..	..	2	100	..	..	..	..	..	..	..	..	..	..	0	0	0
Longleaf Pine	4	Burnett	"	..	..	..	..	..	..	2	..	1	..	..	..	..	..	..	..	1	0	25
Shortleaf Pine	3	"	"	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	1	0	33
New Mexico Pine	10	"	"	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	8	0	80
Arizona Pine	4	"	"	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	3	0	75
Gum	3	"	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	33	1	1	67
Water Oak	2	"	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	0	100
Pin Oak	2	"	"	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	1	0	50
Red Oak	2	"	"	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	0	1	50
Longleaf Pine	6	Boiled in Zinc-Chlo.	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6	0	100
Shortleaf Pine	4	" " "	"	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	2	1	75
Arizona Pine	2	" " "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	0	100
Gum	1	" " "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	0	100
Red Oak	3	" " "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	0	100
Pin Oak	3	" " "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	0	100
Water Oak	1	" " "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	0	100
Shortleaf Pine	4	Bakersfield Oil	"	..	..	..	..	..	..	1	25	..	..	..	..	..	..	..	..	3	0	75
Loblolly Pine	4	" "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	0	100
Arizona Pine*	2	" "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	0	100
New Mexico Pine	3	" "	"	..	..	..	..	..	..	2	66	..	..	..	..	..	..	..	..	1	0	33
Gum	1	" "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	0	100
New Mexico Pine	2	Boiled in Zinc-Chlo., Cal. Oil forced in	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	0	100
" " "	7	Burnett-Cal. Oil	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	7	0	100
Loblolly Pine	1	" " "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	0	100

*The three Bakersfield Crude Oil Ties were removed in 1906 for inspection and were in a perfect state of preservation.

Remarks.—Longleaf and Loblolly soaked with Beaumont Oil absorbed 3 lbs. per cubic foot. (a) Original quantity 50, one out for test. (b) Original quantity 59, one out for test. (c) Original quantity 100, one out for test. (d) Original quantity 100, one out for test. Zinc-creosoted ties, Beaumont oversteamed. Mr. Chanute's ties treated—Chicago; T. T. & L. P. Co.—Somerville; International Creo. Co.—Beaumont; Hassellman, by T. T. & L. P. Co., Somerville.

more or less shaded during the day. No tie plates were used and the track is laid with 60 and 61-lb. rails.

Table I shows the results of eight inspections. The columns under each date give the number of ties removed since the last inspection and the total percentage of ties removed since the beginning of the experiment. The last three columns show the number of ties still in track and divide these ties into two classes —those showing decay and those that are still in good condition. Some of those marked "decay" may be removed this year, and others will be good for one or more years of service. The condition of the ties in the track at the time of the last inspection is stated to be excellent. There is little rail wear except on the tamarack and hemlock ties, and the apparent rail cutting on many ties is due to adzing necessary in changing rail. The hemlock and tamarack ties, although listed in the table as sound, show signs of severe checking and shattering in many cases. Ties treated with Bakersfield crude petroleum, some of which have been in service since 1902, show remarkable preservation. It is a noticeable fact that none of these ties shows the slightest checks, and borings taken in them show the interior to be perfectly sound.

Rail wear on ties treated with zinc chloride followed by a treatment with Bakersfield oil is marked, while the wear on ties treated with Bakersfield oil alone is practically negligible.

Table II shows the percentages of ties of each wood and each treatment still in service in the track. The marked difference in the life of oak ties treated by the Burnettizing and the Wellhouse processes in two plants emphasizes the importance of proper application of a treating process to give satisfactory results. The zinc chloride-English creosote process was applied to oak, beech, hemlock, tamarack, and pine simultaneously and the treatment was more adapted to unseasoned pine than the other species, as indicated by the fact that the pines are showing

Table II—Percentage of Ties Still in Track After 9 Years' Service.

Kind of Wood.	Treatment. Burnett, Chicago.	Burnett, Somerville.	Wellhouse, Chicago.	Wellhouse, Somerville.	Zinc-Creo., Beaumont.	Allardyce, Somerville.	Hassellman, Somerville.	B'm't Oil.	B'm't Oil-Zinc Chlo.	Spirittine, Somerville.
White Oak	36	0	95	58	0	29	16	..	..	..
Red "	72	0	..	0	..	100	0	..	..	..
Black "	..	0	72	12	0	23	0	..	..	..
Turkey "	..	0	..	10	0	100	0	..	..	..
Spanish "	..	57	..	55	20	50	0	..	..	..
Willow "	..	0	..	0	0	0	0	..	..	..
Beech	..	24	..	100	0	20	0	..	..	..
Hemlock	..	70	..	79	12	0	0	..	..	..
Tamarack	..	100	..	100	10	0	0	..	..	..
Shortleaf Pine	..	38	..	21	14	56	1	..	..	..
Longleaf "	..	73	..	45	60	86	5	0	92	15
Loblolly "	..	0	..	5	0	0	0	0	0	0
Redheart "	..	..	..	..	..	..	0	..	..	..

greater service in the track than the oaks. The uniformly poor results shown with the Hassellman treatment is explained by the statement of the treating company that most of the ties submitted to them were in an unsound condition, and that an accident to the treating cylinder prevented an accurate record of the treatment being made. For comparison with these figures, the average life of untreated ties as determined in this test and published in the proceedings of the American Railway Engineering Association is given below:

Loblolly pine	1.5 years	Red oak	3.0 years
Hemlock	1.5 "	Willow oak	3.2 "
Tamarack	2.5 "	Black oak	3.7 "
Beech	2.5 "	Turkey oak	3.85 "
Shortleaf pine ...	2.65 "	Spanish oak	4.1 "
Longleaf pine	3.0 "	White oak. (25% still in track)	

We are indebted to George E. Rex, manager of treating plants of the Atchison, Topeka & Santa Fe, for the results of inspections given above.

TRANSPORTATION FEATURES OF CAR INTERCHANGE.*

I wish to touch upon the mechanical side of the interchange bureau at the Chicago Stock Yards, doing so as a transportation man, and then to take up in detail the transportation features of the bureau and point out to members of this club what we hope to accomplish through this move toward establishing working relations with the mechanical department, not only at the stock yards, but elsewhere, in matters of interchange.

I believe that cardable defects should be carded for instead of running cars on "record," and also that those who are inclined to hold out against the carding practice will gladly accept it if assured the number of cardable defects under M. C. B. rules will be reduced by the action of the M. C. B. Association.

Not many members of the club are directly concerned in the settlement of per diem—the rental which roads pay one another for the use of borrowed cars—but the amounts of money involved are upward of eight millions of dollars a month in this country. The amount paid out for per diem is about four times greater than the amounts paid out for repair settlements between railways. A road cannot pay per diem unless it knows when the cars came on its line, and when they were sent off, and a road cannot know these changes if cars come and go without being reported. These reports are what are spoken of as the interchange reports, and I take it that every member of this club will agree that a report which is the basis of settlements involving such large amounts is an important report. Those of us who are directly involved in the settlement of per diem feel that our difficulties are enormous, and have no hesitancy in saying that they are being reduced in proportion as working relations with the mechanical people in the preparation of interchange reports have been established.

Records taken by the mechanical inspectors of interchanged cars can be made more accurate than records taken by transportation representatives. The reason is that the representatives of the mechanical department do and must go about the inspection of cars in a painstaking, deliberate way. A car in interchange is not and can not be inspected while in motion, and inasmuch as it is inspected while standing still there is every opportunity for the men who do the inspecting to secure the correct initial and number. It is true the transportation people could have their representatives on hand to take the data which they require in the handling of per diem, at the time the mechanical representatives make their inspection, but it should be remembered that at the present time the mchanical inspectors usually work in pairs, and sometimes in teams of three, and rather than have a duplicate staff of men on hand, it would seem better judgment to use the data which the inspectors record, making it serve a double purpose.

We want to protect the avenues of interchange sufficiently to cover the requirements of both departments, and then apportion between the two whatever expense is incurred. The division of the expense between the two departments should be made on a fair and equitable basis, but it ought not to be a stumbling block inasmuch as the money all comes from the same treasury.

At the outset many objections presented themselves. The inspectors were extremely suspicious of the bureau plan. They felt it to be a move to increase their work and decrease their pay. As a matter of fact, it was merely a move to use for an additional purpose the data which they secure, and which railway money pays for. It was a move to stop leaks in interchange reports, by going to the men most likely to know when a car is interchanged. It is gratifying to know that the feeling of hostility on the part of inspectors is very much less than in the beginning. It is true the additional work of taking seals is required of them, and while they may not be entirely reconciled to doing this, they are beginning to realize that the amount of work involved is not so great as they had supposed. They are finding that less than a third of the cars which they inspect have seals, and while there is some extra work involved so far as this one-third of the interchange is concerned, the reports made by inspectors are so arranged as to make it unnecessary for them to do any copying whatever. When the inspection of a cut of cars is completed, the sheet on which the record was made is removed from the book or cover, sent to the office, and a fresh sheet inserted for the next cut, whereas, under the old plan each day's work had to be copied by the inspector from his book to a separate report. The feeling was quite general that the writing of inspectors would not be good enough for the purpose. Others took a different view. The inspectors' ability to do the work satisfactorily has been fully demonstrated.

The committee making the experiment at the stock yards regrets that the expense could not have been lighter. The roads no doubt feel that the experiment has been expensive; but it is better to experiment at one place than at a dozen; and the experiment has been conducted, not alone with reference to the effect of the plan in Chicago, but with reference to what it is hoped to be accomplished throughout the entire country.

The cost per interchange is less in the month just closed than at any previous time in the bureau's history. It is barely possible that some of the roads have an exaggerated idea with respect to the expense at the stock yards. I have secured some figures and desire to bring them to the attention of this club, showing a rough comparison of the cost of interchange at several interchange points.

At Fort Worth, Texas, when a car is interchanged the cost is a trifle less than seven cents. All of this is borne by the mechanical department, one-half by the delivering line and the other half by the receiving line. At Cleveland, Ohio, the cost per interchange without taking into account the cost to the transportation department, is a trifle less than four cents, all of which the mechanical department has to stand. There are some 16 avenues of interchange in Cleveland and in the absence of a co-operative plan between the two departments, the transportation people maintain a larger staff to guard these same points of interchange than do the mechanical people, which being true, the total cost per interchange, is of course increased, and instead of being low, is surprisingly high.

At Pueblo, Colo., the cost is a trifle less than eight cents per interchange, one-half being borne by the delivering line and the other half by the receiving line, but not all of this half is borne by the mechanical department. A portion of it is borne by the transportation department, inasmuch as a portion of the work done is for their benefit.

At the Union Stock Yards in Chicago the cost per inspection in March was a trifle under seven cents, and 45 per cent. of this is borne by the transportation department, leaving only 55 per cent. to be borne by the mechanical department. It is true that in the division of this expense per interchange, as

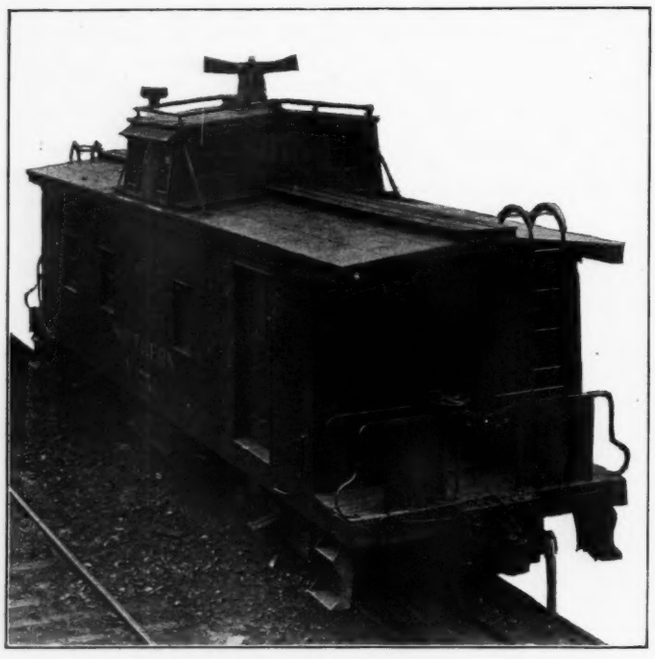
*From a written discussion, Western Railway Club, April 18, by C. B. Strohm, superintendent of transportation, Atchison, Topeka & Santa Fe.

between the trunk lines and the switching line, it is not apportioned on an equal basis, and on this account a comparison of the cost to the trunk lines per interchange at the stock yards, with the cost per interchange elsewhere, has been unfavorable to the bureau plan.

In conclusion: An interchange bureau is nothing more or less than a systematic, co-operative means of handling interchange matters. That system and co-operation are essential in such matters is self-evident. Some may feel that it would be better for the mechanical departments to systematize and co-operate in the matter of car inspection, keeping their organization entirely separate and distinct from the transportation features involved, and that the transportation departments should systematize and co-operate in the gathering and compiling of interchange data, keeping their part of the work separate and distinct from the mechanical features. I grant that a joint inspection bureau run purely upon mechanical lines is an improvement over the plan of each railway undertaking to handle inspection independently of the other. I agree also that a joint interchange bureau operated strictly from a transportation department standpoint is an improvement over the plan of each transportation department undertaking to handle that feature of the work independently of the other. A still better way is to combine the two bureaus into one, calling it a joint inspection and interchange bureau, letting the one set of outside men, and the one office force, and the one staff of supervisors, serve the needs of all concerned, prorating the expense in proportion to the benefits. I believe this is a case where departmental lines may safely be set aside; that the work is so closely related that both departments will benefit by the co-operative plan.

SNYDER'S AIR BRAKE INDICATOR.

O. R. Snyder, a freight conductor on the Southern Railway, with headquarters at Knoxville, Tenn., has in use on his caboose a pair of arms, like semaphore arms, which serve at all times as an indicator, for the benefit of the engineman, giving



Snyder's Air Brake Indicator.

him visible assurance of the condition of the air brake line through the train. In connection with the arms, which constitute the daylight signal, there is a lamp, with a movable colored glass, giving corresponding indications at night.

Fixed in the caboose, beneath the roof of the cupola, is a vertical cylinder, with a piston, the rod of which supports a bracket, within the miniature turret, which controls the signal. The movement of this piston downward pulls the semaphore arms into the horizontal position as shown in the illustration.

Normally, with full pressure in the train line, as when the train is running and the brakes are off, the piston is at the upper end of the cylinder, being held there by pressure conveyed from the train line; and the colored glass is pushed above the level of the flame in the lamp so that at night a white signal is displayed. A reduction in the train line pressure, either accidental or designed, allows the piston to drop, bringing the colored lens in front of the lamp and throwing up the arms. When the indicator is thus made to change its position (the arms going from vertical to horizontal) a whistle is sounded in the caboose. A reduction of 3 lbs. per sq. in. in the pressure of air in the brake-pipe will change the indicator, even in the case of a long train. An angle cock at a point 30 cars ahead of the caboose, being turned, has caused the danger signal to be displayed within 15 seconds.

The reader will understand that the track shown in illustration is not the standard of the Southern. No such shoulderless roadbed is to be found in real life.

Mr. Snyder proposes to organize a company to make this indicator.

The West Siberian Railway.

The difference of opinion over the route of the new railway in West Siberia has been adjusted. The commission consisting of the representatives of six ministries which met last autumn to discuss the matter has come to a decision. The project is now before the Imperial Council and the Council of Ministers, but it is not believed that these two bodies will raise any further objection. The new West Siberian main line will begin at the town of Uralsk, proceeding via Orenburg and Akmolinsk to Semipalatinsk in a due east direction; thence northeast to Barnaul, from which a short branch will run to the prosperous town of Biisk. From Barnaul it will proceed due north to the Great Siberian railway joining it at Ob or Novo-Nikolaievsk. This town is already regarded as the center of the Siberian grain trade and the opening of the new line will give an impetus to its rapid development.

It is believed construction will begin immediately, for the reasons the commission has given for the railway are sufficiently convincing to exclude governmental opposition. The principal arguments presented in support of the construction are as follows: The line is of great strategic importance. It is absolutely necessary in the interest of the colonization of Siberia; for it runs through country that is very fertile and well suited for immigrants, thus aiding the settlement of the agrarian question, not only in Siberia but also in Russia. It traverses a region that is now sparsely inhabited but is capable of producing largely both grain and other natural products. Above all, it opens the enormous natural wealth of the Altai mountain region which, according to the latest researches, will be worth many millions to Siberia. Besides the mountain forests, that are still vaguely known, mines of iron, copper, silver, lead and zinc have been in operation for many years, but have never been properly worked, in spite of the richness of the ores. Freight and other expenses have swallowed up the profits. The new line will transform all this. The new line will be more than 1,360 miles long. It is hoped that it will be open to traffic in five years at latest, as it can be begun at both ends at once. A line has been decided upon in Trans-Caucasia, from Aryss, a station on the Orenburg-Tashkend Line, via Pischpek to Verny. This line will be especially serviceable to the cotton and silk industry in Ferghana province.—*Far Eastern Review.*

The Rosario Western Railway Company, recently registered in London, is contemplating a new Argentine railway in the Province of Santa Fe.

General News Section.

The lower house of the New York state legislature, by a vote of 85 to 20, has passed the Jackson full crew bill.

The Denver & Rio Grande has granted an advance of 10 per cent. in wages to the passenger conductors on its line, and a 7½ per cent. advance to its freight conductors. About 2,000 men are affected by this increase.

On Saturday, Sunday and Monday last, Pierre Vedrine, flying in a monoplane, traveled from Paris to Pau, by a circuitous route, 500 miles in 6 hours, 55 minutes; but not all in a single flight; there were a number of long stops. The time "on the wing" figures out over 72 miles an hour.

Two telephone circuits, with Gill selectors, have just been put into service on the Cincinnati, New Orleans & Texas Pacific from Danville, Ky., to Oakdale, Tenn., 134 miles. One of the circuits is for the use of the train despatcher and the other for messages. Much of this division is double-track, but the train wire is said to be a very busy one.

The Bureau of Railways in the Department of Internal Affairs of the state of Pennsylvania no longer has a superintendent and an assistant superintendent, a law having been passed abolishing these offices and creating those of chief and assistant chief of the bureau. The chief of the bureau is Freeman C. Gerberich, heretofore assistant superintendent.

The Pennsylvania Railroad has renewed for a period of one year from May 1, the temporary agreement under which it operates the New York station and tunnels owned by the Pennsylvania Tunnel & Terminal Railroad Company. This extension of time has been made, because it has not as yet been possible to gather all data necessary to establish a satisfactory basis for a long term lease.

At Daytona Beach, Fla., April 23, Bob Burman ran an automobile one mile in 25.40 seconds, and two miles in 51.28 seconds; or at the rate of 141.73 miles an hour for one mile, and 140.40 miles an hour for two miles. This is faster than any man ever before traversed the face of the earth, the highest record by vehicles on rails being 130½ miles an hour, which was made in the electric car experiments in Germany, October 27, 1903.

The Philadelphia Rapid Transit Company has refused a request of its conductors and motormen for an increase of pay from 23 cents an hour to 28 cents. The company tells the employees that there is an over-supply of men at the present rates, and says that the sum of $3,000 a month is paid out to extra men, who, under the agreement made when the strike was settled a few months ago, have to be carried on the pay rolls at $2 a day.

On Thursday, April 20, for about one hour, operators of the Western Union Telegraph Company worked through between New York City and Douglas, Ariz., by way of Los Angeles, a distance of 3,865 miles. This circuit was made up for the associated press to enable the agent in New York to communicate directly with the agent in Douglas. There were repeaters in the circuit at Chicago, Kansas City, Dallas, El Paso and Los Angeles.

In its twenty-second annual report the relief department of the Chicago, Burlington & Quincy shows that during 1910 a total of $579,204 was contributed by its members, and that the benefits paid to members amounted to $643,854. The membership at the end of the year was 26,925, an increase of 31 over the previous year. The number of disabilities reported during the year was 19,343, of which 17,853 recovered, and 209 resulted in deaths, leaving 1,281 disabilities at the end of the year.

A special train of 60 cars, which contained 15,000 rolls of carpet, left Chicago on April 19 via the Chicago & North Western on its way to Omaha, Neb. The shipment originated at Yonkers, N. Y., and was taken to Buffalo by the New York Central, and from there to Chicago by the Michigan Central. From Omaha it will go over the Union Pacific and the Southern Pacific to San Francisco, where it goes to supply the demand on the Pacific coast. The total weight of the carpet in the train was 1,500,000 lbs., and it was valued at almost $1,000,000.

The Kansas Grain Dealers' Association will ask to inter-plead in a case brought by the state to compel the railways hauling grain from Kansas to Kansas City, and the large elevator operators at Kansas City, Kan., to allow the inspection and weighing of all grain entering the Kansas City market. The defendants refused to pay the fee, which was raised by a recent state law from a flat rate of 50 cents a car to 1 cent per 1,000 lbs. of grain, and the grain dealers, who believe, with the railways in the suit, that the charge is unreasonable, propose to assist in fighting its collection.

The appointment of F. G. Athearn as manager of the bureau of economics of the Southern Pacific Company, with office at San Francisco, Cal., has been announced in these columns. Referring to the duties of Mr. Athearn, an officer of the road writes that they "will be to establish harmony between the railway and its patrons. It is hoped to accomplish this by educating the public and our own employees, by means of public addresses and through correspondence, as to the fundamental principles and needs underlying successful railway operation. The time has come when the railways must appeal their case to the people."

The committee on relations of railway operation to legislation has issued a revised edition of its bulletin giving the number of bills affecting railway operation which have been introduced in state legislatures during the present year; and the total number is 512, or 38 more than the number reported in the first bulletin, which was reproduced in the *Railway Age Gazette* of April 7, page 869. The additional 38 measures comprise the following: Ten in Iowa; 5 in Arkansas; 4 in Illinois; 1 in Indiana; 3 in Michigan; 7 in Minnesota; 1 in Missouri; 3 in New Jersey; 1 in New York; 2 in Rhode Island, and 1 in Washington.

A. J. Earling, president of the Chicago, Milwaukee & St. Paul, has offered a prize of a thousand-dollar silver cup for the best oats grown in the United States during the present season. The prize is to be given at the American Land and Irrigation Exposition, which is to be held in New York next November, and at which farm and orchard products from all parts of the country will be displayed. It is Mr. Earling's belief that much of the land opened by the recently completed Puget Sound extension of the St. Paul is capable of producing the best crops in the country, and it is his aim to arouse popular interest in it.

A new book of instructions printed in nine languages has just been issued by the Pennsylvania Railroad for the government of employees working on or about the tracks. The 16 rules are first given in English, and following it are translations into German, Greek, Hungarian, Italian, Lithuanian, Polish, Slovak and Swedish. In the average track gang in this section of the country there are from three to six nationalities represented. The poorer classes of immigrants are not so very ignorant; foremen who are in charge of the track gangs say that practically all of the men can read, and that rarely is one found who cannot sign his name.

On April 12, a Pacific type locomotive, equipped with Schmidt superheater, with seven all-steel mail cars and two Pullman cars on train No. 43, of the New York Central & Hudson River, made the three miles between Depew, N. Y., and Lancaster, in one minute and 51 seconds. The first mile was made in 38 seconds, the second in 37 seconds and the third in 36 seconds. Thirty-six seconds is at the rate of 100 miles an hour. The time was taken by a traveling engineer who was riding on the locomotive, and the record is therefore only semi-official. The locomotive was one of those recently delivered to the New York Central Lines and was described in our issue of March 31, page 785.

The numerous proposals for the construction of new subways in New York City, which have been the subject of tedious discussions by city and state officers and the newspapers for many months, are drawing to a close; at least, this is the assurance of Mayor Gaynor. The most tangible fact given out in support of this view is, that the Brooklyn Rapid Transit

Company, which several months ago proposed to operate subways throughout the city, has this week presented a revised proposal embracing an elaborate scheme for the operation of subways in Manhattan, Brooklyn, the Borough of Bronx, and in Staten Island, connection with the island to be made by a tunnel beneath the narrows. The Brooklyn Rapid Transit Company, while proposing to spend $75,000,000 on equipment of the proposed lines and on extensions of its existing elevated lines in Brooklyn, stipulates that all of the new subways embraced in the plan for Manhattan and for other boroughs outside of Brooklyn, shall be built and paid for by the city. The estimated financial burden on the city would be over $80,000,000.

Disastrous Train Wreck in South Africa.

A press despatch from Grahamtown, South Africa, April 23, reports 23 persons killed and many injured in the wreck of a passenger train which plunged off a bridge and fell into a gorge 250 ft. deep. This was on the Kowie Railway at Blaauwkrantz. The extrication of the injured and dying victims from the wreck was extremely difficult. A large mass of wreckage lodged on a ledge half-way down, and it was many hours before the passengers were taken out. This work had to be done by hoisting in sacking.

Prizes for First Aid to the Injured.

The American Red Cross, using the interest received on a fund of $5,000 which has been given to it, is to offer prizes among railway men for proficiency in first aid to injured persons; and also will give prizes and medals for excellence in competitive drills in this work. The first prize will be $50; the second, $25, and so on.

Sardines and Cotton Seed.

Texas and Maine are closer together than brothers, whether they like the situation or not. A correspondent at Belfast writes: "The Maine Central is up against one of the troublesome features of the interstate commerce law," and he goes on to tell of a case which is parallel to the Galveston wharf case, recently decided by the United States Supreme Court. The Maine Central owns some unused land at Belfast, which it was proposed to lease at a nominal rental to a sardine packery which would produce much freight for the company. The lease was to be for 99 years, and the packers have put a considerable sum of money into the building of a granite sea wall. Now the railway learns that, being a transportation company engaged in interstate commerce, it must not allow the use of any of its property, except for a fair price, and, says our correspondent, "the people of Belfast fear that they will lose an industry." Waiving the question of whether it is possible to lose anything that you do not possess, it might be suggested that a reduction of the freight rate on the sardines ought to be practicable. If such a reduction should result in stimulating sardine shipments at a lot of other places, in addition to Belfast—why, that would only enhance the good results of the railway's public spirit.

A Fast Schedule.

The Canada division of the Michigan Central once more calls attention to the fact that, in the language of the turf, it is a "fast track." "The Detroiter," the new passenger train of the Michigan Central, and the New York Central (train No. 48), from Detroit to New York, is scheduled over the Canada division from Windsor to Bridgeburg, 226.24 miles, in 3 hours, 40 minutes, or at the rate of 61.7 miles an hour. This is claimed to be the fastest regular schedule in the world for so great a distance; and, so far as we can find from the records, the claim is well founded. The train makes one stop, at St. Thomas, of five minutes. Deducting this stop, the schedule speed is over 63 miles an hour. The train leaves Windsor at 8 p. m. and is due at Bridgeburg at 11:40. The Great Western of England has trains scheduled 194 miles at 56.7 miles an hour. The Pennsylvania has one train scheduled from Manhattan Transfer to North Philadelphia, 77.5 miles, in 77 minutes, or at the rate of 60.4 miles an hour. The longest distance for which we find a train scheduled faster than this is 59 miles over the West Jersey & Seashore, where one train traverses the distance in 52 minutes, or at the rate of 68.1 miles an hour.

The Canada division of the Michigan Central, straight and level, and having the minimum of junctions and large stations, has been the scene of fast runs for many years. On May 7, 1896, a train of three cars was run over the division at 65 miles an hour; on September 5, 1901, a train of five cars at 62½ miles an hour; on April 27, 1904, a train of four cars at 68.3 miles an hour, and on May 21, 1910, a train of 12 cars filled with locomotive runners, at 61.93 miles an hour (224 miles in 217 minutes, without a stop).

Earnings of United States Steel Corporation.

The United States Steel Corporation reports net earnings for the quarter ended March 31, 1911, $23,519,203, as compared with $25,990,978 for the quarter ended December 31, 1910, and $37,616,876 for the quarter ended March 31, 1910. The total net earnings of the United States Steel Corporation for the first quarter of 1911, amounting to $23,519,203, failed to come up to public expectations by at least $3,500,000. The favorable feature of the statement is the rising tendency of net earnings. For example, they were $5,869,416 in January, $7,180,928 in February and $10,468,859 in March. The March earnings show an increase over January of approximately 80 per cent. Earnings in the first quarter of 1909 were $22,921,000; 1908, $18,229,000; 1905, $23,025,000; 1904, $13,445,000; 1903, $25,068,000, and 1902, $26,715,000. Earnings of $10,468,859 in March, 1911, can be regarded as favorable, comparing with $7,989,000 in 1909, $7,466,000 in 1908, $9,585,000 in 1905, $6,036,000 in 1904, $9,912,000 in 1903 and $10,135,000 in 1902. The surplus for the quarter was $31,155 as compared with $6,532,531 for the first quarter of 1910. Sinking funds on bonds of subsidiary companies, depreciation and extraordinary replacement charges aggregated a total of $3,517,386. In the first quarter of 1910 similar charges amounted to $6,113,682. Net earnings in the first quarter were at the rate of $94,076,812 a year. On the other hand, March earnings were at the rate of nearly $126,000,000 a year.

How to Catch Passengers.

Courteous diplomacy is the secret of the ticket agent's success. The first requisite is real interest in the inquirer. When the prospective passenger enters an office, he feels complimented to find a clerk ready and smilingly willing to wait on him, and correspondingly disgusted if a clerk sits in a chair at a desk and perfunctorily answers the questions propounded—volunteering nothing. It is well to allow a prospective passenger to have his full say, the clerk merely acquiescing pleasantly until a conversation of discussion is opened; in this way the ticket seller will frequently get the customer's measure while concealing his own, and this alone is a prime advantage.

It frequently happens that a shopper has really made up his mind to use a line other than yours and merely comes in to confirm his judgment. This class of passenger is very often converted to your line by well-timed remarks on his good judgment, followed up by pointing out some particular advantage of your line that had been unknown to him such as "By-the-by, here is something on our line that the world should know more of, but you are aware how difficult it is to make everybody cognizant of such wonderful things as this!" Then show him an illustration of, say, the Spiral Tunnels or Lake Louise, and follow it up by the comment of some authority on railway engineering or mountain scenery.

It happens at times that the inquiring passenger is not stupid, but simple, and in such cases it is well to establish acquaintance along lines familiar to him. It is probable such a passenger is from a farming community, and it sometimes occurs that the ticket seller is either familiar with his particular district or perhaps knows some person in that vicinity, or has some knowledge of farming and its requirements—in fact, any ticket seller who is out for business will find some avenue of interest to attract and hold such a man's confidence with the desired result. Then there is the "prospect," who either has or assumes all knowledge—this man can invariably be landed by asking his opinion on the relative merits of railways, of service, etc., and indicating to him by your attitude that you respect his knowledge.

Another type is the inquiring passenger who really is in perplexity; such a one's patronage is almost certain if painstaking interest is taken in him. Show him the route map; indicate specially, with red ink if necessary, the line he will travel; make an itinerary; show him a sleeping car or its picture; mark on the map or annotated time table two or three places that he must not

miss under any consideration—and then the money is yours.

How great a percentage of possible patrons will enter a ticket office and say, "Is this the Great Central?" or "Is this the Union ticket office?" or "Is this the X., Y., Z.?" and how often the clerk will answer, "No; corner Third and Madison." This is wrong, because this is the fellow you are after; he must be held until his business is ascertained. Maybe the "Canadian Pacific" will do him just as well or better, and even if it does not, "It pays to advertise." Show him and probably part of your information will stick.—*A. B. Calder, Canadian Pacific.*

American Electric Railway Engineering Association.

At a meeting of the Executive Committee held November 15, 1910, a resolution was passed authorizing the secretary to send out a circular letter to all member companies and associate members giving an outline of the work laid down for the standing committees for the present year. This circular letter tells of the work in hand by the standing and special committees, and says that sub-committees have been appointed from the standing committees to serve on sub-committees of the American Society for Testing Materials, who are drawing up specifications for wrought iron, steel in rails and rolled steel wheels.

International Association of Railway Special Agents and Police.

At the annual meeting of the International Association of Railway Special Agents and Police, which was held at Chattanooga, Tenn., April 18 to 21, the following officers were elected for the ensuing year: President, M. B. Earle, Birmingham, Ala.; first vice-president, P. J. Kindelon, San Francisco, Cal.; second vice-president, H. C. Harold, Buffalo, N. Y.; third vice-president, L. T. Phelps, Bluefield, W. Va.; secretary and treasurer, W. C. Pannell, Baltimore, Md. Buffalo, N. Y., was chosen as the place of the next annual meeting.

Committees of the American Railway Engineering Association.

The following new directors of the American Railway Engineering Association have been elected: J. A. Atwood, Pittsburgh & Lake Erie; J. B. Berry, Rock Island Lines; W. B. Storey, Jr., Santa Fe. The new name of the association became effective on April 24.

The new committees of the association, together with their instructions, are as follows:

COMMITTEE I.

Roadway.

1. Present formulae of general application for determining waterway areas under varying conditions, with consideration also of hydraulic features.
2. Report on unit pressures allowable on roadbeds of different materials, conferring with the Committee on Ballast.
3. Report on tunnel construction and ventilation.
4. Report on the question of agricultural drainage as it affects railways:
   (a) Laws and assessments.
   (b) Methods of construction of drainage channels through railways.

J. E. Willoughby (L. & N.), Chairman; W. M. Dawley (Erie), Vice-Chairman; J. R. W. Ambrose (G. T.); John C. Beye (C. R. I. & P.); D. J. Brumley (I. C.); W. C. Curd (M. P.); Paul Didier (B. & O.); R. C. Falconer (Erie); S. B. Fisher (M. K. & T.); T. H. Gatlin (Southern); C. B. Hoyt (N. Y. C. & St. L.); C. S. Millard (C. C. C. & St. L.); A. C. Prime (Pennsylvania); H. J. Slifer (C. G. W.); J. A. Spielmann (B. & O.); John G. Sullivan (C. P.); W. D. Pence (University of Wisconsin); F. L. Wheaton (D. L. & W.); W. P. Wiltsee (N. & W.); R. C. Young (L. S. & I); L. W. Baldwin (I. C.).

COMMITTEE II.

Ballast.

1. Report on the proper depth of ballast to insure uniform distribution of the loads on the roadbed, conferring with Committee on Roadway.
2. Report on physical tests of stone for ballast.
3. Complete review on gravel ballast and recommended methods for grading the different qualities.

H. E. Hale (M. P.), Chairman; J. M. Meade (A. T. & S. F.), Vice-Chairman; W. J. Bergen (N. Y. C. & St. L.); C. C. Hill (M. C.); F. J. Stimson (G. R. & I.); F. T. Darrow (C. B. & Q.); T. W. Fatherson (C. R. I. & P.); A. S. More (C. C. C. & St. L); E. V. Smith (B. & O.); H. L. Gordon (B. & O.); J. M. Egan (I. C.); S. B. Rice (R. F. & P.); T. C. Burpee (Intercolonial); G. H. Harris (M. C.); J. V. Neubert (N. Y. C. & H. R.); A. F. Blaess (I. C.); S. A. Jordan (B. & O.); S. N. Williams (Cornell College).

COMMITTEE III.

Ties.

1. Study the size of cross-ties required for the stresses to which they are subjected.
2. Report on the saving in track labor brought about by the use of treated ties.
3. Report on the effect of the design of tie-plates and spikes on the durability of the tie.
4. Report on the renewal of cross-ties in continuous stretches versus single tie renewals.
5. Report on the use of cypress timber for cross-tie.
6. Report on the use of metal, composite and concrete ties.

L. A. Downs (I. C.), Chairman; W. F. H. Finke (Southern), Vice-Chairman; F. G. Jonah (St. L. & S. F.); E. E. Hart (N. Y. C. & St. L.); G. W. Merrell (N. & W.); W. J. Burton (M. P.); J. G. Shillinger (C. C. C. & St. L.); H. C. Landon (Erie); F. R. Layng (B. & L. E.); L. M. Perkins (N. P.); H. K. Wicksteed (C. N. Q.); D. O. Lewis (C. N. P.); H. W. Brown (Pennsylvania); L. C. Hartley (C. & E. I.); H. S. Wilgus (P. S. & N.); E. D. Jackson (B. & O.); G. D. Swingly (B. & O.); D. W. Thrower (I. C.); Duncan MacPherson (Transcontinental).

COMMITTEE IV.

Rail.

1. Recommend changes in specifications for steel rails.
2. Present recommendations on standard rail sections.
3. Continue investigation of the breakage and failure of rails and present summary of conclusions drawn from reports received.
4. Report on the results obtained from the use of open-hearth and special alloy steel rails, and the chemical composition of such rails.
5. Present reports on the results of tests made on the various kinds of rail in conjunction with the Manufacturers' Committee on the revolving machine at South Chicago and the reciprocating machine at Sparrows Point.
6. Report on the strength of rail joints, with a view to recommending design and specifications.
7. Report on standard drilling for rails.
8. Report upon the advisability of using rails longer than 33 ft., including estimates of relative cost.

Chas. S. Churchill (N. & W.), Chairman; R. Montfort (L. & N.), Vice-Chairman; E. B. Ashby (L. V.); J. A. Atwood (P. & L. E.); A. S. Baldwin (I. C.); J. B. Berry (C. R. I. & P.); M. L. Byers (M. P.); W. C. Cushing (Pennsylvania); F. A. Delano (Wabash); Dr. P. H. Dudley (N. Y. C. L.); C. H. Ewing (A. C.); John D. Isaacs (Harriman Lines); Thos. H. Johnson (Pennsylvania); H. G. Kelley (G. T.); C. A. Morse (A. T. & S. F.); G. W. Kittredge (N. Y. C. & H. R.); D. W. Lum, (Southern); J. T. Richards (Pennsylvania); J. P. Snow (B. & M.); A. W. Thompson (B. & O.); R. Trimble (Pennsylvania); M. H. Wickhorst (Rail Committee); C. W. Huntington (C. R. N. J.).

COMMITTEE V.

Track.

1. Present general specifications covering material and workmanship for frogs, crossings and switches, including the use of manganese and other special alloys.
2. Present general specifications for track bolts, nutlocks, tie-plates, common track spikes and screw-spikes.
3. Study designs of main-line turnouts.

J. B. Jenkins (B. & O.), Chairman; G. J. Ray (D. L. & W.), Vice-Chairman; L. S. Rose (C. C. C. & St. L.); Garrett Davis (C. R. I. & P.); L. R. Leighty (M. P.); Curtiss Millard (C. G. W.); A. Bruner (N. & W.); E. G. Ericson (Pennsylvania); T. H. Hickey (M. C.); Raffe Emerson (A. T. & S. F.); J. M. R. Fairbairn (C. P.); H. T. Porter (B. & L. E.); P. C. Newbegin (B. & A.); W. G. Raymond (Iowa State University); S. S.

Roberts (I. C.); F. A. Smith (civil engineer); R. A. Van Houten (Erie); W. J. Towne (C. & N. W.); H. R. Safford (Edgar Allen & Co.); R. O. Rote (L. S. & M. S.); R. M. Pearce (P. & L. E.); Geo. H. Bremner (C. B. & Q.); C. H. Stein (C. R. of N. J.); Thomas Maney (L. & N.); F. S. Stevens (P. & R.).

COMMITTEE VI.

Buildings.

1. Report on the advantages and disadvantages of various types of freight house floor construction.

2. Continue the study of roof coverings.

3. Present principles covering the design of inbound and outbound freight houses.

4. Continue the study of reinforced concrete coaling stations.

Maurice Coburn (Vandalia), Chairman; M. A. Long (B. & O.); Vice-Chairman; O. P. Chamberlain (C. & I. W.); W. F. Schultz (Memphis Union Station Co.); A. T. Hawk (C. R. I. & P.); C. G. Delo (C. G. W.); W. S. Thompson (Pennsylvania); C. F. W. Felt (A. T. & S. F.); J. W. Orrock (C. P.); N. H. LaFountain (C. M. & St. P.); A. T. Tomlinson (G. T. P.); J. S. Metcalf (contracting engineer); C. H. Fake (M. R. & B. T.); E. N. Layfield (Grade Separation Commission); J. P. Canty (B. & M.); W. T. Dorrance (N. Y. C. & H. R.); G. W. Andrews (B. & O.); H. A. Lloyd (Erie); J. O. Thorne (C. B. & Q.); W. G. Arn (I. C.).

COMMITTEE VII.

Wooden Bridges and Trestles.

1. Report on the formulae for use in determining the strength of sheet piling.

2. Report on equipment required for pile driving.

3. Collect information on special methods of driving sheet piles in cofferdams where conditions do not permit the use of ordinary equipment.

4. Collect information of actual experience on the bearing power of piles and on the practical results of the use of formulae.

5. Report on the use of guard rails for wooden bridges and trestles.

6. Report on fire protection of wooden bridges and trestles.

C. C. Wentworth (N. & W.), Chairman; W. F. Steffens (B. & A.), Vice-Chairman; F. H. Bainbridge (C. & N. W.); F. E. Bissell (A. C. & Y.); W. S. Bouton (B. & O.); R. D. Coombs (consulting engineer); Hans Ibsen (M. C.); Henry S. Jacoby (Cornell University); J. A. Lahmer (K. C. S.); I. L. Simmons (C. R. I. & P); H. Rettinghouse (C. & N. W.); E. A. Hadley (M. P.); B. R. Leffler (L. S. & M. S.)

COMMITTEE VIII.

Masonry.

1. Report on waterproofing of masonry and bridge floors, including methods, cost and results.

2. Report on principles for design of plain and reinforced concrete retaining walls and abutments.

3. Report on the principles of design of reinforced concrete trestles, and state advantages resulting from their use.

4. Report on the best methods of repairing the worn surface of plain and reinforced concrete.

5. Report upon conditions which tend to produce disintegration of the concrete, or corrosion of the reinforcement.

6. Report on methods for depositing concrete under water.

G. H. Tinker (N. Y. C. & St. L.), Chairman; F. L. Thompson (I. C.), Vice-Chairman; T. L. Condron (consulting engineer); B. Douglas (Detroit River Tunnel Co.); L. N. Edwards (G. T.); F. E. Schall (L. V.); A. N. Talbot (University of Illinois); Job Tuthill (C. H. & D.); L. D. Crear (Erie); A. A. Wirth (Pennsylvania); H. E. Boardman (M. P.); L. J. Hotchkiss (C. B. & Q.); A. H. Griffith (B. & O.); G. J. Bell (A. T. & S. F.); J. H. Prior (C. M. & St. P.); W. H. Petersen (C. R. I. & P.); G. H. Scribner, Jr. (contracting engineer).

COMMITTEE IX.

Signs, Fences and Crossings.

1. Continue the investigation of ways and means for securing a proper quality of fence wire to resist corrosion and secure durability.

2. Report on the relative advantages and disadvantages of the different kinds of fence posts.

3. Report on the best form of track construction and flangeways at street crossings in paved streets.

4. Report on the relative advantages and disadvantages of the different kinds of telegraph poles.

K. J. C. Zinck (G. T.), Chairman; C. H. Stein (C. R. of N. J.), Vice-Chairman; F. M. Patterson (C. B. & Q.); E. R. Lewis (M. C.); H. E. Billman (M. P.); G. E. Boyd (I. C.); L. C. Lawton (A. T. & S. F.); A. M. Funk (B. & O.); J. B. Myers (B. & O.); C. H. Splitstone (Erie).

COMMITTEE X.

Signals and Interlocking.

1. Continue investigation of outline and description of a comprehensive and uniform signal system, suitable for general adoption, conferring with proper committee of the American Railway Association.

2. Revise mechanical interlocking specifications, and include wrought iron pipe as well as steel.

3. Revise electric interlocking specifications, and submit statement of the results from experience.

4. Report on the effect of treated and metal ties on track circuits.

A. H. Rudd (Pennsylvania), Director-Chairman; L. R. Clausen (C. M. & St. P.), Vice-Chairman; Azel Ames (United States Train Control Board); C. C. Anthony (Pennsylvania); H. Baker (C. N. O. & T. P.); H. S. Balliet (N. Y. C. & H. R.); W. G. Besler (C. R. of N. J.); W. B. Causey (C. G. W.); C. A. Christofferson (N. P.); C. E. Denney (L. S. & M. S.); W. J. Eck (Southern); W. H. Elliott (N. Y. C. & H. R.); M. H. Hovey (Wisconsin Railway Commission); A. S. Ingalls (L. S. & M.); J. C. Mock (Detroit River Tunnel); F. P. Patenall (B. & O.); J. A. Peabody (C. & N. W.); Frank Rhea (General Electric Co.); W. B. Scott (Harriman Lines); Thos. S. Stevens (A. T. & S. F.); H. H. Temple (B. & O.); E. F. Wendt (P. & L. E.); J. C. Young (U. P.); A. G. Shaver (C. R. I. & P.); G. E. Ellis (K. C. T.).

COMMITTEE XI.

Records and Accounts.

1. Make a comprehensive study of the forms in the Manual which were adopted a number of years ago.

2. Study the economical way of managing a storehouse so as to assure a minimum stock of material at all times.

H. J. Pfeifer (Terminal Railroad Association), Chairman; M. C. Byers (St. L. & S. F.), Vice-Chairman; Edward Gray (Southern); E. E. Hanna (M. P.); Henry Lehn (N. Y. C. & H. R.); J. H. Milburn (B. & O.); C. W. Pifer (I. C.); Guy Scott (Pennsylvania); W. A. Christian (C. G. W.); R. W. Willis (C. B. & Q.); G. J. Graves (A. T. & S. F.); J. M. Brown (C. R. I. & P.); C. W. Cochran (C. C. C. & St. L.); G. T. Warren (B. & O.); H. Stephens (L. S. & M. S.).

COMMITTEE XII.

Rules and Organization.

1. Continue the compilation of rules for the government of maintenance of way employees.

2. Formulate rules in the nature of specifications or instructions regarding the conduct of work, making use of the recommendations of the various committees dealing with these subjects, and of the best practice of railway companies as embodied in their books of rules.

J. O. Osgood (C. R. of N. J.), Chairman; F. L. Nicholson (N. & S.), Vice-Chairman; F. D. Anthony (Q. M. & S.); G. D. Brooke (B. & O.); E. J. Correll (M. P.); C. Dougherty (C. N. O. & T. P.); F. P. Gutelius (C. P.); J. A. Gordon (C. G. W.); K. Hanger (C. R. I. & G.); Jos. Mullen (C. C. C. & St. L.); J. B. Dickson (Erie); W. C. Smith (N. P.); S. E. Coombs (N. Y. C. & H. R.); J. B. Carothers (B. & O.).

COMMITTEE XIII.

Water Service.

1. Report on the design and relative economy of track pans from an operating standpoint.

2. Present typical plans and specifications for tank supports.

3. Report on the use of reinforced concrete for water tanks and supports.

Robert Ferriday (C. C. C. & St. L.), Chairman; J. L. Campbell (El. P. & S. W.), Vice-Chairman; E. G. Lane (B. & O.); James Burke (Erie); H. M. Church (B. & O. S. W.); G. H. Herrold (C. G. W.); A. Mordecai (consulting engineer); W. A. Parker (St. J. & G. I.); Chas. E. Thomas (I. C.); C. L. Ran-

som (C. & N. W.); A. F. Dorley (M. P.); G. C. Millett (A. T. & S. F.).

COMMITTEE XIV.

Yards and Terminals.

1. Report on typical situation plans of passenger stations, of both through and stub types, with critical analyses of working capacity, and include a review of the different methods of estimating their capacity.
2. Report on developments in the handling of freight by mechanical means.
3. Report on developments in the design and operation of hump yards.
4. Report on typical situation plans for a division engine terminal.
5. Report on methods of handling baggage, express and mail at passenger terminals.

C. H. Spencer (Washington Terminal Co.), Chairman; E. B. Temple (Pennsylvania), Vice-Chairman; Hadley Baldwin (C. C. C. & St. L.); W. C. Barrett (B. & O.); M. S. Blaiklock (Grand Trunk); G. H. Burgess (D. & H.); A. E. Clift (I. C.); Maurice Coburn (Vandalia); H. T. Douglas, Jr. (W. & L. E.); A. C. Everham (K. C. Terminal); D. B. Johnston (Pennsylvania); H. A. Lane (B. & O.); L. J. McIntyre (N. P.); B. H. Mann (M. P.); A. Montzheimer (C. L. S. & E.); W. L. Seddon (S. A. L.); A. Swartz (Erie); J. E. Taussig (H. & T. C.); E. E. R. Tratman (Engineering News); W. L. Webb (C. M. & St. P.); J. G. Wishart (C. R. I. & P.).

COMMITTEE XV.

Iron and Steel Structures.

1. Continue investigation of impact and secondary stresses.
2. Continue investigation of the influence of experiment and experience on theory of bridge design.
3. Report on rules for instruction and guidance of inspectors in mill, shop and field.
4. Study the design of built-up columns, co-operating with other investigators and committees of other societies.
5. Report on the methods of protection of iron and steel structures against corrosion.

C. H. Cartlidge (C. B. & Q.), Chairman; A. J. Himes (N. Y. C. & St. L.), Vice-Chairman; J. A. Bohland (G. N.); Chas. Chandler (C. G. W.); C. L. Crandall (Cornell University); J. E. Crawford (N. & W.); Albert Reichmann (American Bridge Co.); J. E. Greiner (B. & O.); J. M. Johnson (Louisville Bridge & Iron Co.); C. N. Monsarrat (C. P. R.); W. H. Moore (N. Y. N H. & H.); W. F. Robinson (A. T. & S. F.); C. C. Schneider (consulting engineer); O. E. Selby (C. C. C. & St. L.); C. E. Smith (M. P.); I. F. Stern (C. & N.); F. E. Turneaure (University of Wisconsin).

COMMITTEE XVI.

Economics of Railway Location.

1. Continue the consideration of all questions connected with railway location, alinement grades and improvement of alinement and grades affecting the economic operation with relation to traffic, tonnage ratings, speed, density of traffic and financial considerations, with the special aim in view of establishing uniform methods and unit values for investigating and comparing different routes and making improvements in alinement and grade alinement.

A. K. Shurtleff (C. R. I. & P.), Chairman; R. N. Begien (B. & O.), Vice-Chairman; C. Frank Allen (Massachusetts Institute of Technology); Willard Beahan (L. S. & M.); C. K. Conard (Erie); A. C. Dennis (civil engineer); W. A. James (C. P.); C. P. Howard (civil engineer); C. J. Parker, N. Y. C. & H. R.); F. W. Smith (C. C. C. & St. L.); Francis Lee Stuart (B. & O.); W. D. Taylor (C. & A.); Walter Loring Webb (consulting engineer); M. A. Zook (C. G. W.).

COMMITTEE XVII.

Wood Preservation.

1. Continue investigation of proper grouping of different timbers for antiseptic treatment.
2. Compile available information from service tests.
3. Investigate the merits of various preservatives, giving especial attention to oil from water gas tar, and to the use of refined coal tar in creosote oil.
4. Report on the desirability of revising the adopted specifications for creosote oil.
5. Recommend forms for the inspection of preserving processes.
6. Present specifications for impregnation with creosote oil.
7. Report on the value of impregnation with crude oil.
8. Report on the value of brush coating and dipping.

Earl Stimson (B. & O.), Chairman; E. H. Bowser (I. C.), Vice-Chairman; W. H. Courtenay (L. & N.); G. M. Davidson (C. & N. W.); H. B. Dick (B. & O. S. W.); W. W. Drinker (Erie); R. H. Ford (M. P.); Dr. W. K. Hatt (Purdue University); V. K. Hendricks (St. L. & S. F.) George E. Rex (A. T. & S. F.); E. A. Sterling (Pennsylvania); C. M. Taylor (C. R. of N. J. and P. & R.); H. Von Schrenk (C. R. I. & P,); Charles Yoder (L. S. & M. S.); C. E. Knickerbocker (N. Y. O. & W.).

COMMITTEE XVIII.

Electricity.

1. Continue the consideration of the subject of clearance.
2. Continue the preparation of a standard specification for overhead transmission line crossings.
3. Report on the effect of electrolytic action on metallic structures, and the best means of preventing it.
4. Report on methods of insulation and protection.

G. W. Kittredge (N. Y. C. & H. R.), Chairman; J. B. Austin, Jr. (L. I.), Vice-Chairman; N. E. Baker (I. C.); R. D. Coombs (consulting engineer); A. O. Cunningham (Wabash); L. C. Fritch (C. G. W.); Geo. Gibbs (P. T. & T. R.); G. A. Harwood (N. Y. C. & H. R.); E. B. Katte (N. Y. C. & H. R.); C. E. Lindsay (N. Y. C. & H. R.); W. S. Murray (N. Y. N. H. & H.); J. R. Savage (L. I.).

COMMITTEE XIX.

Conservation of Natural Resources.

1. Continue the study of tree planting and general reforestation.
2. Continue the study of coal and fuel oil resources.
3. Continue the study of iron and steel resources.

E. O. Faulkner (A. T. & S. F.), Chairman; William McNab (G. T.), Vice-Chairman; R. H. Aishton (C. & N. W.); Moses Burpee (B. & A.); F. F. Busteed (C. P.); C. H. Fisk (C. S.); W. A. McGonagle (D. M. & N.); G. A. Mountain (Canadian Railway Commission); W. L. Park (I. C.); G. H. Webb (M. C.).

SPECIAL COMMITTEES.

Uniform General Contract Forms.

1. Report on general contract forms.

J. C. Irwin (Rutland), Chairman; W. G. Atwood (L. E. & W.), Vice-Chairman; E. F. Ackerman (L. V.); W. L. Breckinbridge (C. B. & Q.); R. G. Kenly (M. & St. L.); E. H. Lee (C. & W. I.); C. A. Paquette (C. C. C. & St. L.); H. C. Phillips (A. T. & S. F.); J. H. Roach (L. S. & M S.); H. A. Woods (G. T. P.).

Grading of Lumber.

1. Continue the collection of current specifications, Grading and Inspection Rules, for maintenance of way timber and lumber not heretofore reported on, and present same for all classes of maintenance of way timber and lumber which will conserve the interests of railways and be acceptable to manufacturers' associations; conferring with committees of this association and with other organizations whose work is affected.

W. H. Sellew (M. C.), Chairman; B. A. Wood (M. & O), Vice-Chairman; D. Fairchild (N. P.); R. Koehler (S. P.); A. J. Neafie (D. L. & W.); W. H. Norris (M. C.); C. W. Richey (Pennsylvania); Dr. H. Von Schrenk (C. R. I. & P. and St. L. & S. F.); F. B. Walker (N. P.).

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; annual convention, May 23-26, Chicago.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911, Niagara Falls, N. Y.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., Sept. 19, 1911.

American Association of Freight Agents.—R. O. Wells, East St. Louis, Ill.; June 20-23, Kansas City, Mo.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York.

American Railway Association.—W. F. Allen, 24 Park Place, New York; May 17, New York.
American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Oct. 17-19, 1911, St. Louis, Mo.
American Railway Engineering Association.—E. H. Fritch, Monadnock Block, Chicago.
American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., S. Louis, Mo.; May 9-10, 1911, Detroit, Mich.
American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.
American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.
American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; June 27-July 1, Atlantic City, N. J.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.
American Society of Engineering Contractors.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York; next convention, May 30-June 2, Pittsburgh, Pa.
Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago.
Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago; May 24-26, Montreal, Can.
Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; semi-annual, June 16-17, Washington, D. C.
Association of Railway Telegraph Superintendents.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911, Boston, Mass.
Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York; June 20-21, Cape May City, N. J.
Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug., Montreal.
Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.
Car Foremen's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.
Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan., and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.
Civil Engineers' Society of St. Paul.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug., St. Paul.
Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.
Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.
Freight Claim Association.—Warren P. Taylor, Richmond, Va.; June 21, St. Paul, Minn.
General Superintendents' Association of Chicago.—H. D. Judson, 209 East Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.
International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York; May 23-26, Omaha, Neb.
International Railway Congress.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.
International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 15-18, 1911, Chattanooga, Tenn.
International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; July 25-27, Chicago.
International Railroad Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio.
Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August, Des Moines.
Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.
Master Car and Locomotive Painters' Association, of United States and Canada.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.
New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.
New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.
Northern Railway Club.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.
Omaha Railway Club.—H. H. Maulick, Barker Block, Omaha, Neb.; second Wednesday.
Railroad Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.
Railway Club of Pittsburgh.—C. W. Alleman, P. & L. E., Pittsburgh, Pa., 4th Friday in month, except June, July and August, Pittsburgh.
Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa.; June 13, New York; annual, Oct. 10, Colorado Springs, Colo.
Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; annual, May 22-24, 1911, Milwaukee, Wis.
Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.
Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Oct., 1911, St. Louis.
St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.
Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.
Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.
Southern & Southwestern Railway Club.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.
Toledo Transportation Club.—L. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.
Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.
Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.
Traffic Club of Pittsburgh.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly, Pittsburgh.
Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911, Baltimore, Md.
Transportation Club of Buffalo.—J. M. Sells, Buffalo; first Saturday after first Wednesday.
Transportation Club of Detroit.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August 29-September 1, Chicago.
Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.
Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except, June, July and August.
Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August, Chicago.
Wood Preservers' Association.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

Reporters in New York learn that the Florida tourist travel of the past winter has been very satisfactory in volume.

The Pennsylvania Railroad on one of its 28-hour trains, now runs day coaches through between New York and Chicago. Heretofore only sleeping-car passengers have been carried through without change.

The New York, New Haven & Hartford announces that it will establish at Boston the "New England Lines Industrial Bureau," to promote agricultural and manufacturing industry. The head of the bureau will be William H. Seeley, at present general freight and passenger agent of the Central New England.

Arrangements have been made by the New York Central & Hudson River and the Boston & Maine by which regular through passenger service will be established between Boston and Buffalo over these lines. Up to this time through cars have been run only in the rushes of the vacation seasons. (See also Financial News.)

Since the beginning of March, the "North Coast Limited," of the Northern Pacific, which runs from St. Paul to Puget Sound, has arrived at Spokane from the east every day on time, and only twice in March and in April once has it been late in reaching the coast. The train makes a run of over 1,900 miles through five states.

Attorney General Major of Missouri has advised the State Railway Commission not to attempt to reduce the state passenger rates, or interfere in any way with railway rates, until a decision has been reached in the cases now before the Supreme Court involving the reductions in rates required by the state authorities. He believes that any interference on the part of the commission at this time might tend to weaken the state in this litigation.

The New York & Hudson Steamboat Company, running boats between New York City and Hudson, N. Y., has made a new traffic agreement with the Boston & Albany, by which through rates will be made on freight to and from all stations on that road, and to carry the additional freight which is expected the company has built two new steamboats. This makes five in all, in the service of the company, and there will be two sailings a day from New York.

The United States Motor Company prints a statement to the effect that in the month of March (27 working days), it shipped 2,639 carloads of automobiles; and another to the effect that on a single day's shipments from its factories the freight bills amounted to $12,944. These freight bills represented 108 carloads sent to 27 different states. The factories are situated in Providence, R. I.; Hartford, Conn.; Tarrytown, N. Y.; Detroit, Mich.; Dayton, Ohio, and Newcastle, Ind.

On wheat and corn, delivered by vessels at Lake Erie ports, the trunk line railways have put in effect, beginning April 27, a rate of 4 cents a bushel to New York and Boston; and a rate of 3.7 cents to Philadelphia and Baltimore. These rates are made to meet Canadian competition and expire October 31. This action is in consonance with the suggestion which was made by the Interstate Commerce Commission in its recent decision on the subject of grain rates from Buffalo to Boston.

Governor Hadley of Missouri has vetoed the Phelps bill, which prohibited a railway from charging a higher passenger rate per mile between any two points on its line than between any other two points. He said it was his belief that the measure might be declared unconstitutional. The Carter bill was signed. This gives the state railway commission power to fix maximum passenger rates in Missouri, and provides for a classification of the roads with reference to their earnings per mile for fixing the passenger rates. The governor also signed the bill giving the railway commission power to fix express rates, to establish free delivery zones in cities of 1,000 or more population, and to fix the amount express companies shall pay railways for carrying express.

The Kansas City-Missouri River Navigation Company, which has been organized by several business men of Kansas City to establish a boat line on the Missouri river between Kansas City and St. Louis to compete with the railways, has agreed to make 80 per cent. of the rail rates the maximum charges on its line; and at the start it will charge the maximum rates. No tariffs will be published the first year, and it is announced that the classification of freight will be the same as on the railways. To prevent the company from coming under the jurisdiction of the Interstate Commerce Commission, no through bills of lading will be issued for points outside of Missouri, shipments for points beyond St. Louis having to be reconsigned at that place.

John L. Mathews, secretary of the Mississippi Valley Transportation Company, which is about to open a barge line service on the Mississippi, between St. Louis and New Orleans, has given out a statement in which he expresses regret that the business men of St. Louis have not taken more active interest in the company. It was started in the fall of 1909, and now has a capital of $135,000, very little of which was subscribed by St. Louis people, although when it was proposed the Businsss Men's League indorsed the project and advised the merchants and manufacturers of St. Louis to give it financial support. Mr. Mathews, who is about to resign, says that although he is disappointed at the lack of interest shown by St. Louis, that has nothing to do with his leaving the company.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 93, giving a summary of car shortages and surpluses by groups from December 10, 1909, to April 12, 1911, says:

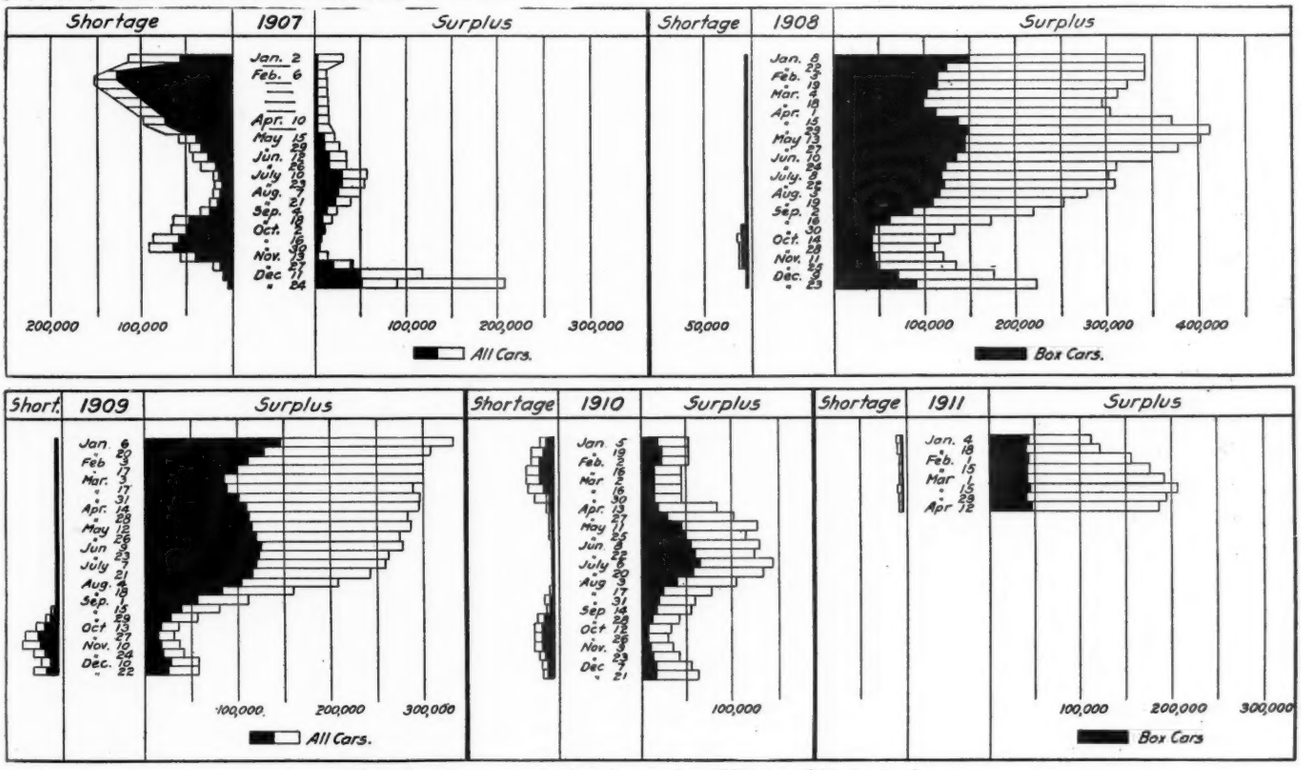
"There has been a decrease of 16,971 in the coal car surplus during the two weeks since our last bulletin, but an increase of 6,993 in the box car surplus, with a slight increase in the surplus of flat cars, brings the net decrease down to 8,998 cars, leaving a total of 187,219 surplus cars of all classes. In group 1 (New England), 2, (Eastern), 3, (Central), and 4, (Middle Atlantic), where the coal car accumulation has been the heaviest, there are decreases in the total group surpluses, while in the West and Northwest the increase in box car surplus caused increases in the total group figures. Group 9 (Southwestern), 11 (Canadian), and 1 (New England) show some decreases in box as well as in the total of all classes."

The accompanying table gives surpluses and shortages by groups for the latest period covered by the report, and the chart shows totals for 1907 to 1911, inclusive.

Car Surpluses and Shortages.

Date.	No. of roads.	Surpluses: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—April 12, 1911	8	1,077	1,753	1,318	262	4,410	0	25	0	28	53
" 2.— " 12, 1911	24	2,674	187	25,753	8,793	37,412	16	0	2	0	18
" 3.— " 12, 1911	26	4,429	1,466	45,456	4,351	55,702	0	0	0	197	197
" 4.— " 12, 1911	10	2,427	249	6,222	1,489	10,387	8	285	0	0	294
" 5.— " 12, 1911	19	4,617	587	4,579	1,417	11,200	10	50	0	1	61
" 6.— " 12, 1911	25	10,870	1,435	3,319	5,054	20,678	31	17	8	100	156
" 7.— " 12, 1911	4	1,640	115	1,479	456	3,690	0	0	0	0	0
" 8.— " 12, 1911	15	8,499	626	3,234	3,095	15,454	0	4	0	0	4
" 9.— " 12, 1911	10	2,799	517	472	732	4,520	0	0	0	300	300
" 10.— " 12, 1911	21	6,738	2,388	2,098	9,471	20,686	0	2	0	4	6
" 11.— " 12, 1911	6	1,764	491	35	790	3,080	48	0	0	29	77
Total	168	47,539	9,814	93,956	35,910	187,219	113	384	10	659	1,166

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland, and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia, and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and the Dakotas lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages in 1907 to 1911 Inclusive.

Traffic Club of New York.

At the meeting of the Traffic Club of New York, held April 25, Frederick Monsen gave an interesting illustrated lecture on

The Panama Canal and Its Makers. Besides a number of well-chosen pictures of various phases of the work there were some highly interesting moving pictures showing work underway, for instance there was a picture of "a slide taken from a slide while it slid."

Total February Earnings and Expenses.

Logan G. McPherson, director of the Bureau of Railway Economics, in Bulletin No. 12, giving a summary of revenues and expenses of steam roads in the United States for February, 1911, says:

For the month of February, 1911, total operating revenues decreased from the same month of 1910 about $3,500,000, which was equivalent to $29 per mile, or 3.2 per cent. This decrease was entirely in freight revenue, and was in part offset by an increase of nearly $13 per mile in passenger and miscellaneous revenue. Operating expenses were almost stationary as compared with a year ago, the increase amounting to only 0.8 per cent. There was an increase of 2 per cent. in maintenance of equipment and 2.1 per cent. in transportation expense, but these increases were offset by a decrease of 5.8 per cent. in maintenance of way. The operating ratio was 74.7 per cent., as compared with 74.9 per cent. in January, 1911, and 71.7 per cent. in February, 1910.

Net operating revenue showed a decrease of $34 per mile, or 13.6 per cent. It is clear that this decrease was due to a decline in revenues rather than an increase in expenses.

Net revenue per mile per day was $7.68, as compared with $7.51 in January. November, 1910, showed a daily average per mile of $11.91, and December of $9.96. There was an increase in taxes of 2.2 per cent., and operating income, which is net revenue with taxes and outside operations included, consequently showed a decline of $35 per mile, or 16.6 per cent.

Increase in total operating revenue was confined to the southern group of roads. This increase was found in both freight and passenger revenue. In the eastern and western groups, the decrease in freight revenue was large enough to more than offset increases in passenger revenue. In operating expenses the South showed an increase of 8.2 per cent., which was generally distributed through the different accounts. In the East the increase was 2.8 per cent., which was a resultant of increases in transportation and general expenses and decreases in the other accounts. The West, as in the previous month, showed a decline in operating expenses amounting to 2.9 per cent. There was a decrease of 13.9 per cent. in maintenance of way, and, of still more significance, a decline of 2.8 per cent. in transportation expense. The variations in this last account correspond more closely with those of gross revenue than do the variations in any of the others. This is the first instance of a decrease in transportation expense in any of the three groups since these bulletins began to be issued in July, 1910, although a statement was erroneously made in the January bulletin to the effect that there had been such a decrease in the western group. The operating ratio increased in all three groups, the greatest increase being in the eastern group, where it rose from 73.1 per cent. in 1910 to 77.7 per cent. in 1911. The South alone shows any increase in net revenue, and in that group the per cent. of increase is only 1.6. The East shows a decline of nearly 20 per cent., and the West of 12 per cent. Operating income shows corresponding results, a decrease of 25 per cent. in the East, and nearly 14 per cent. in the West, and again in the South of only 0.2 per cent.

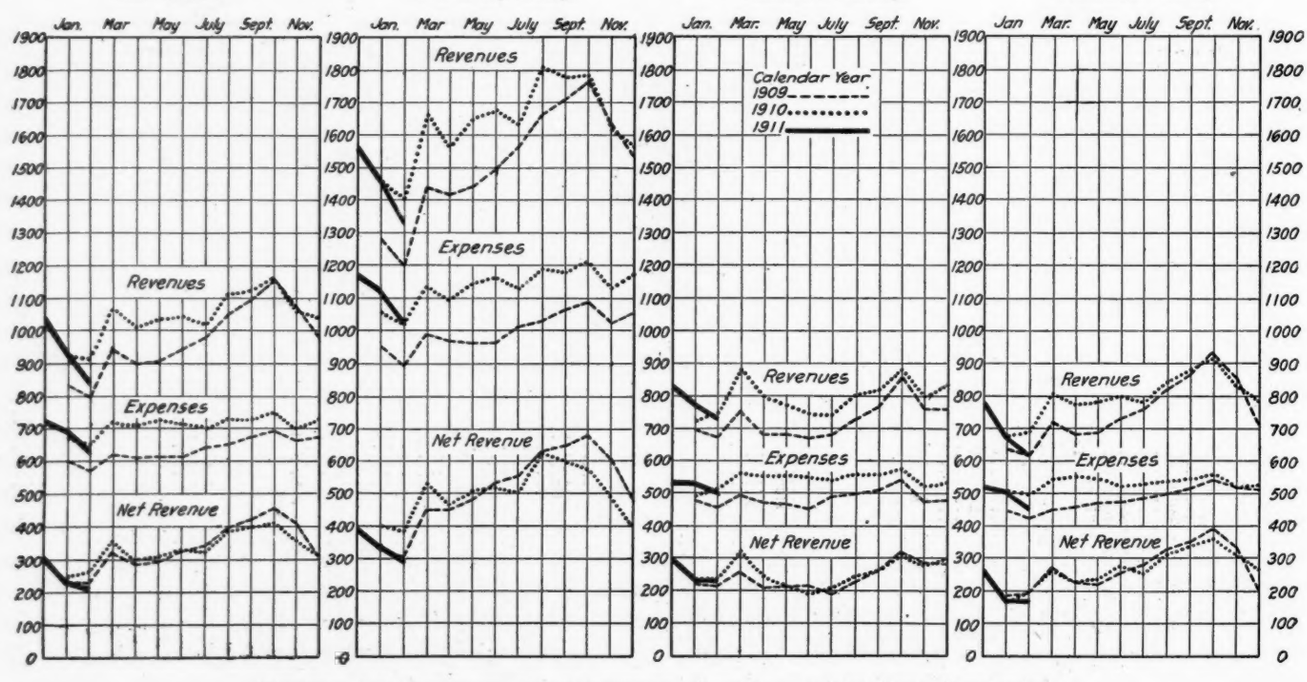
For the eight months of the fiscal year 1911, there is an increase of operating revenues per mile for all roads of 1.8 per cent. over the corresponding period of 1910. However, expenses increased 6.6 per cent., with the result that net revenue shows a decrease of 7.3 per cent. This decrease runs as high as 13 per cent. in the eastern group. In the southern group there is a slight increase, amounting to 1.1 per cent.

The calendar year to date makes an even more unfavorable showing than do the eight months of the fiscal year, because in addition to increasing expenses, there is the fact of declining revenues. Operating revenues for these two months for all roads declined 1.4 per cent., all the decrease being in freight revenue. Expenses increased 2.1 per cent., with the result that net revenue shows a decrease of 10.3 per cent., and operating income of 12.8 per cent. As has been the case during the eight months of the fiscal year, the heaviest decline in net revenue is found in the eastern group. The South alone shows any increase, and this is the result of increasing revenues rather than decreasing expenses.

The accompanying chart shows the variation in revenues and expenses in the separate months:

Ratio of Expenses to Total Operating Revenue.

	Feb., 1911.	Feb., 1910.	Fiscal year ended June 30, 1910.
Percentage of Total Operating Revenue—			
Maintenance of Way and Structures..	11.7	12.0	13.4
Maintenance of Equipment.....	17.4	16.5	15.0
Traffic Expenses	2.4	2.3	2.0
Transportation Expenses	40.3	38.2	33.4
General Expenses	3.0	2.7	2.5
Total Operating Expenses.....	74.7	71.7	66.3



Earnings and Expenses of all Railways Showing a Three-Year Comparison.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF FEBRUARY, 1911. (SEE ALSO ISSUES APRIL 14 AND 21.)

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama Great Southern	309	$261,663	$81,472	$378,377	$56,991	$76,635	$11,101	$115,851	$9,593	$270,171	$108,206	—$808	$13,241	$94,157	$1,830
Ann Arbor	301	104,859	28,541	142,570	11,808	20,600	3,771	52,651	6,773	95,603	46,967	—3,180	14,265	29,522	18,664
Atlanta, Birmingham & Atlantic	662	192,291	40,238	246,576	32,289	37,091	15,476	89,635	11,499	185,990	60,586	.....	10,500	50,086	21,524
Bangor & Aroostook	627*	235,804	33,553	281,501	49,186	29,845	2,730	95,004	9,907	186,672	94,829	.....	2,525	92,304	—20,190
Central Vermont	411	182,970	56,675	259,797	32,225	43,479	5,661	182,768	7,392	271,525	—11,728	234	11,750	—23,244	45,300
Charleston & Western Carolina	341	162,756	23,142	193,336	30,939	14,848	2,971	62,152	3,805	114,715	78,621	.....	4,475	74,146	26,337
Chicago, Indiana & Southern	329	272,191	18,925	299,832	35,176	65,297	6,972	118,567	8,320	234,333	65,499	—2,615	13,900	48,984	—79,901
Chicago, Rock Island & Gulf	471†	150,043	51,538	217,102	24,388	25,910	8,719	79,327	7,833	146,177	70,925	—62	9,501	61,362	26,138
Cincinnati, New Orleans & Texas Pacific	337	577,907	145,384	759,004	56,146	183,390	20,220	222,063	17,790	499,609	259,395	—6,259	21,800	231,336	—35,021
Detroit, Toledo & Ironton	441	93,023	10,048	110,129	24,770	6,497	2,477	70,392	4,974	109,110	1,019	.....	6,712	—5,693	346
Duluth, South Shore & Atlantic	611	126,921	51,875	190,805	34,959	29,083	10,653	93,419	6,227	174,341	16,464	—937	18,000	—2,473	—38,547
Evansville & Terre Haute	310	111,732	54,425	185,787	21,116	19,675	5,543	67,258	6,025	119,617	66,170	—613	9,410	56,147	20,348
Fort Worth & Denver City	454	203,839	100,170	324,234	35,632	77,212	5,966	122,326	15,163	256,299	67,935	—991	10,522	56,422	—76,940
Georgia	307	194,067	60,366	271,683	35,469	39,493	10,230	120,716	7,638	213,546	58,137	.....	1,600	56,537	13,139
Grand Rapids & Indiana	587	258,091	90,735	380,302	51,952	76,681	10,187	185,989	14,482	339,291	41,011	48	23,351	17,708	—14,448
Hocking Valley	350	340,496	57,739	418,980	48,248	86,457	7,981	154,795	18,543	316,024	102,956	.....	24,300	78,656	—108,005
Houston & Texas Central	789	318,386	108,896	464,355	84,339	58,898	19,597	237,419	20,392	420,644	43,711	—1,702	17,842	24,167	—8,252
Long Island	395	193,417	339,067	561,353	100,592	106,619	12,651	384,022	19,096	622,980	—61,627	16,104	53,333	—98,856	68,111
Morgan's La. & Texas R. R. & S. S. Co.	404‡	218,447	110,486	349,935	69,243	42,401	12,669	140,439	15,216	279,968	69,967	—728	18,756	50,483	—39,481
New Orleans, Mobile & Chicago	404	120,519	24,752	152,847	22,723	9,006	2,750	47,401	8,577	90,457	62,390	.....	3,910	58,480	9,028
Norfolk Southern	608	164,414	48,345	228,622	24,718	23,982	4,798	75,480	13,650	142,628	85,994	—76	5,900	80,017	—
Northern Central	469	675,548	151,099	881,427	167,148	201,818	14,210	469,922	24,805	877,903	3,524	259	36,740	—32,957	—108,946
Northwestern Pacific	376	78,762	96,952	194,349	42,051	37,062	2,894	101,469	9,247	192,723	1,626	.....	10,700	—9,074	—20,473
Peoria & Eastern	351	185,338	47,919	252,549	34,901	52,061	5,627	124,599	6,504	223,692	28,857	.....	9,500	19,357	—24,811
Pittsburgh & Lake Erie	191	878,571	102,935	1,017,173	120,904	117,613	15,246	274,648	24,515	552,926	464,247	—563	30,000	433,684	—169,591
Rutland	468	128,782	65,367	218,900	26,044	48,609	8,341	111,483	8,447	202,924	15,977	.....	9,878	6,098	—25,122
St. Louis, Brownsville & Mexico	501§	84,332	59,485	155,873	35,301	10,037	2,440	62,552	8,234	118,564	37,309	.....	4,500	32,809	6,611
San Antonio & Aransas Pass	727	192,630	77,011	289,747	76,283	37,966	5,428	123,368	11,577	254,622	35,125	.....	11,000	24,125	—7,499
Santa Fe, Prescott & Phoenix	364¶	88,932	33,285	130,182	23,759	7,833	3,260	39,129	5,554	79,535	50,647	.....	103	50,544	—3,951
Spokane, Portland & Seattle	433	213,339	72,038	305,431	20,862	36,287	5,120	72,640	8,971	143,880	161,551	—619	38,000	122,932	89,396
Texas & New Orleans	458	223,069	86,943	328,413	56,022	46,722	7,885	131,973	9,223	251,825	76,588	919	12,257	65,250	14,678
Toledo & Ohio Central	444	228,061	44,644	284,138	55,594	46,438	5,806	128,427	6,861	243,126	41,012	105	20,344	20,773	—47,653
Toledo, St. Louis & Western	451	217,815	29,943	266,431	30,789	47,016	7,645	108,535	8,422	202,407	64,024	.....	14,550	49,474	2,101
Virginian	474‖	226,072	16,605	250,636	32,073	55,404	4,992	75,488	7,719	175,676	74,960	5,201	17,600	62,561	23,644
West Jersey & Seashore	353	113,035	183,121	317,134	74,071	48,380	8,996	182,964	10,028	324,439	—7,305	—2,084	23,228	—32,617	2,607
Wheeling & Lake Erie	457	380,163	38,298	447,228	38,330	101,425	6,904	176,535	13,126	336,320	110,908	4,758	19,472	96,194	—31,096
EIGHT MONTHS OF FISCAL YEAR 1911.															
Alabama Great Southern	309	$2,063,481	$771,616	$3,090,641	$383,406	$689,366	$83,281	$930,882	$73,488	$2,160,423	$930,218	—$6,025	$109,076	$815,117	$74,090
Ann Arbor	301	894,361	339,193	1,316,269	164,612	159,096	31,570	447,041	58,274	860,593	455,676	978	111,731	344,923	53,828
Atlanta, Birmingham & Atlantic	662	1,371,982	419,450	1,907,427	230,457	297,061	118,779	694,686	73,659	1,414,642	492,785	.....	59,146	403,639	80,816
Bangor & Aroostook	627*	1,500,857	441,100	2,058,261	352,402	244,869	26,797	646,610	85,325	1,356,003	702,258	.....	18,149	684,109	—58,735
Central Vermont	411	1,671,568	738,471	2,605,621	321,862	394,561	56,491	1,200,657	60,809	2,034,380	571,241	4,594	86,366	489,469	—25,973
Charleston & Western Carolina	341	983,512	250,051	1,289,981	230,479	150,057	25,023	429,719	30,606	865,884	424,097	.....	35,800	388,297	128,377
Chicago, Indiana & Southern	329	2,160,027	196,943	2,424,384	338,526	476,365	71,267	955,365	71,432	1,912,955	511,429	—1,197	108,493	401,739	—249,704
Chicago, Rock Island & Gulf	471†	1,407,325	486,903	2,022,079	301,553	153,671	73,205	720,520	65,669	1,314,618	707,461	—2,298	48,675	656,488	—5,555
Cincinnati, New Orleans & Texas Pacific	337	4,881,578	1,167,878	6,355,454	636,603	1,222,966	165,658	1,776,972	142,521	3,944,720	2,410,734	—14,527	173,416	2,222,791	163,689
Detroit, Toledo & Ironton	441	1,078,993	115,324	1,296,083	259,143	199,956	22,348	691,438	45,108	1,217,993	78,090	—73	53,696	24,321	2,011
Duluth, South Shore & Atlantic	611	1,349,261	664,298	2,126,261	299,091	235,811	79,899	812,966	56,645	1,484,412	641,849	6,971	141,871	506,949	—18,176
Evansville & Terre Haute	310	1,158,201	495,232	1,824,021	225,240	248,969	44,433	591,645	51,232	1,161,519	662,502	—6,044	75,280	581,178	25,141
Fort Worth & Denver City	454	2,408,755	1,169,960	3,742,547	359,654	596,400	48,338	1,163,243	117,884	2,285,519	1,457,028	—10,716	81,044	1,365,268	—114,253
Georgia	307	1,468,613	614,678	2,217,801	286,029	334,334	84,167	879,649	58,078	1,642,257	575,544	.....	16,313	559,231	4,266
Grand Rapids & Indiana	587	2,054,100	1,194,210	3,501,750	454,114	574,987	98,789	1,554,016	118,340	2,800,246	701,504	—219	192,831	508,454	—228,763
Hocking Valley	350	4,169,718	609,718	5,088,386	645,830	814,926	70,428	1,617,105	135,224	3,283,513	1,804,873	.....	228,265	1,576,608	—257,187
Houston & Texas Central	789	3,096,086	1,153,165	4,534,298	618,193	527,803	147,759	1,774,438	170,819	3,239,012	1,295,286	—3,559	147,319	1,144,408	2,790
Long Island	395	2,009,271	4,334,760	6,663,536	767,658	947,441	139,220	3,190,649	178,848	5,223,816	1,439,720	494,464	368,088	1,566,096	—460,840
Morgan's La. & Texas R. R. & S. S. Co.	404‡	2,522,786	817,101	3,546,310	473,944	401,231	89,535	1,210,678	109,188	2,284,576	1,261,734	—12,937	156,745	1,092,052	—12,017
New Orleans, Mobile & Chicago	404	925,505	230,521	1,236,307	170,156	98,454	22,701	364,205	64,680	720,196	516,111	.....	34,742	481,369	92,368
Norfolk Southern	608	1,229,826	520,897	1,886,934	210,222	226,322	38,953	588,390	110,028	1,173,915	713,019	3,778	48,000	668,797	—
Northern Central	469	6,513,659	1,557,254	8,576,458	1,509,739	1,647,052	135,807	4,041,122	199,162	7,532,882	1,043,576	5,007	260,872	787,711	—928,053
Northwestern Pacific	376	962,342	1,138,512	2,270,847	399,684	326,761	22,786	848,151	73,636	1,671,019	599,828	.....	84,600	515,228	—41,381
Pecria & Eastern	351	1,832,781	495,255	2,502,987	321,087	410,883	48,455	1,044,136	46,373	1,870,934	632,053	.....	76,878	555,175	—85,996
Pittsburgh & Lake Erie	191	9,385,811	1,091,686	10,800,947	1,315,202	1,044,000	115,944	2,593,223	189,871	5,258,240	5,542,707	—2,992	216,576	5,323,139	—1,402,996
Rutland	468	1,249,103	794,436	2,311,233	309,617	354,854	57,993	894,886	56,837	1,674,187	637,046	.....	84,941	552,105	—32,914
St. Louis, Brownsville & Mexico	501§	749,319	397,691	1,239,169	350,681	100,589	18,500	448,467	63,326	981,563	257,606	.....	38,500	219,106	19,369
San Antonio & Aransas Pass	727	2,066,775	768,029	3,000,000	543,527	380,523	40,059	1,049,980	79,639	2,093,728	906,272	.....	78,000	828,272	27,762
Santa Fe, Prescott & Phoenix	364¶	759,965	287,969	1,118,390	197,375	102,004	22,500	352,172	45,262	719,313	399,077	.....	844	398,233	—28,291
Spokane, Portland & Seattle	433	2,148,418	668,140	2,972,747	344,016	202,960	32,373	793,942	76,702	1,449,992	1,522,755	—7,608	260,600	1,254,547	757,999
Texas & New Orleans	458	1,765,956	723,518	2,643,971	467,610	451,301	57,710	1,047,524	76,601	2,100,746	543,225	4,170	98,511	448,884	—152,485
Toledo & Ohio Central	444	2,911,406	460,470	3,547,317	480,062	477,578	52,907	1,192,315	61,552	2,264,414	1,282,903	—369	150,502	1,132,032	150,935
Toledo, St. Louis & Western	451	2,059,998	321,745	2,539,293	333,095	367,864	68,796	893,649	75,245	1,738,649	800,644	.....	113,150	687,494	—128,538
Virginian	474‖	2,099,505	175,843	2,341,503	266,274	384,521	41,124	643,718	60,781	1,396,418	945,085	38,548	114,156	869,477	614,105
West Jersey & Seashore	353	1,211,041	2,715,928	4,191,242	656,718	517,887	128,999	1,744,436	85,478	3,133,518	1,057,724	—45,283	183,093	829,348	27,624
Wheeling & Lake Erie	457	3,862,926	426,574	4,595,783	505,417	910,811	66,663	1,644,318	109,761	3,236,970	1,358,813	25,435	165,958	1,218,290	—80,636

Mileage operated on February 28, 1910—* 546 miles; † 530 miles; ‡ 348 miles; § 456 miles; ¶ 257 miles; ‖ 444 miles; — indicates deficits, losses and decreases.

President Finley to the Farmers of the South.

The consumption of meat products in the United States is constantly increasing and there is a steady demand for American meats in foreign markets.

The maximum number of cattle, other than milch cows, in the United States, was 51,566,000 on January 1, 1907. On January 1, 1910, the latest year for which figures have been published, the number was 47,279,000, a decrease of 4,287,000 or 8.3 per cent. in three years. The maximum number of hogs reported was 56,982,000, on January 1, 1901. On January 1, 1910, the number was 47,782,000, a decrease of 9,200,000, or 16.1 per cent. The maximum number of sheep reported was 63,965,000, on January 1, 1903. On January 1, 1910, the number was 57,216,000, a decrease of 6,749,000, or 10.5 per cent.

The decrease in the number of cattle has been in large measure due to the cutting up of the great western ranges into farms. These great ranges are now becoming a thing of the past, and the meat supply of the United States, both for home consumption and for export, must, to an increasing extent, be produced on the farms. A publication recently issued by the United States agricultural department on beef production in Alabama serves to emphasize the advantages of the South as a live stock region, for results equally as favorable as those in Alabama are being obtained in other States throughout the South, and much that the report says as to the growing of beef applies with equal force to other live stock. This report sums up the reasons why the farmers of the South should engage more extensively in the growing of beef cattle substantially as follows:

The South, under the system of farming heretofore prevailing, has thousands of acres of land, and good land, too, which are not being used at all. Statistics show that only about 40 per cent. of the tillable or arable land of the South is being used. Sixty per cent. of the land is lying idle and returns no income to the owner. The farms are large, and, principally because of the lack of sufficient labor, many acres are not being used. At present there is no better way to put the whole farm to work than by introducing beef cattle into the system. They require but a small amount of labor in addition to that employed in the other work of the farm. The report to which I have referred emphasizes the importance of cattle raising in connection with diversified farming and building up soil fertility. It says: "As the farmers learn the value of diversification in farming operations there will be an increased amount of roughage, such as corn fodder, cowpea and clover hays, and soy beans, which many times can be marketed more profitably through the beef animals than in any other way. The beef cattle serve as important machines for converting the surplus fodders into valuable barnyard manure, which gives to the growing crops not only the benefits of its fertilizing elements, but enhances the natural condition of the soil by the addition of that important compound—humus."

The department has conducted some careful experiments to determine the value of barnyard manure. In these experiments it was demonstrated that the average increase in crop yields obtained by the use of barnyard manure alone gave it a value of $3.35 per ton, and that barnyard manure combined with commercial fertilizers had a value of $4.88.

On a plantation where corn and cotton were grown an experiment was conducted which would seem to be of interest to farmers throughout the cotton belt. On part of the land on this plantation devoted to corn, peas were grown in the corn. After the corn had been gathered the peas and the stalks were grazed by steers, which were fed some cotton seed in addition to the grazing. The next season cotton was grown on part of this land and corn on part of it. As a result of the crop of peas and the grazing, the yield of cotton per acre was 626.5 pounds of seed cotton greater on an area where corn alone had been grown. On the part devoted to corn the increased production was 14 bushels per acre. . . .

Southern farmers are favorably located with reference to markets for live stock. With the growth of commercial and industrial communities throughout the southern states, the home demand is constantly increasing. I may illustrate this by quoting United States Agricultural Department statistics showing that during the year 1907 more than 15,000 home-raised animals, including beef cattle, veal, hogs, sheep, and kids, were slaughtered in one of our large southern cities, while 36,097 live western animals were shipped into the same city and slaughtered. In addition to this total of more than 51,000 live animals there were also shipped into the city large amounts of fresh and cured meats. . . .

Taking all of the advantages of the South into consideration, I do not believe that any other section of the United States is better suited for the profitable growing of live stock as a feature of diversified farming and as a means not only of obtaining profit directly from the sale of live animals and meat products, but also as a means of utilizing lands which are now lying idle, and of increasing the production of cotton and other farm products of the South by building up soil fertility.

INTERSTATE COMMERCE COMMISSION.

The commission, by an order issued April 19, has suspended until August 15, tariffs presented by the Missouri Pacific showing increased freight charges on cotton.

Complaint Dismissed.

Furnace Run Saw Mill & Lumber Co. v. Boston & Maine et al. Opinion by the Commission:

Defendant's rate on spruce lath and lumber from Boston to Toledo not found to be unjustly discriminatory or unreasonable. (20 I. C. C. 586.)

Rates on Horses Reduced.

Arizona Railway Commission v. Wells Fargo & Company. et al. Opinion by the commission:

Defendant's rates for the transportation of horses, in carloads, of $500 between El Paso, Texas, and Phoenix, Ariz.; $400 between Phoenix, Ariz., and Los Angeles, Cal.; and $575 between Phoenix, Ariz., and San Francisco, Cal., found unreasonable to the extent that they exceed, respectively, $300, $320 and $470, which rates are prescribed for the future. (20 I. C. C. 571.)

Rates on Fertilizer Reduced.

Meridian Fertilizer Factory v. Vicksburg, Shreveport & Pacific, et al. Opinion by the commission.

Rates on commercial fertilizer from Shreveport, La., to Hamburg, Ark., and Crossett reduced from 12½ and 13 cents per 100 lbs. to 11 cents. (20 I. C. C., 554.)

The Initial Carrier Held Responsible.

Platten Produce Co. v. Kalamazoo, Lake Shore & Chicago, et al. Opinion by Commissioner Prouty.

At the rehearing of this case it was shown that the initial carrier delivered a shipment of grapes to an intermediate carrier with a waybill specifically calling for a certain routing, and the initial carrier is therefore responsible for the misrouting, but complainant is not entitled to recover in this proceeding for the icing charges which it was compelled to pay. (20 I. C. C., 543.)

New Rates on Lumber Sanctioned.

In re investigation of proposed schedules of rates on lumber by the Vicksburg, Shreveport & Pacific. Opinion by Commissioner Meyer.

The Vicksburg, Shreveport & Pacific filed a new schedule of rates, effective September 19, 1910, and the commission suspended these rates until investigation could be made. The new rates do not appear to be such as to require the commission to further suspend the operation, and therefore they are sanctioned. (20 I. C. C., 575.)

Express Rate on Sample Brick Reduced.

Ohio Face Brick Manufacturers' Asso. v. Adams Express Co., et al. Opinion by the commission.

Express companies charge merchandise graduated rates for the transportation of sample brick. Brick manufacturers are almost wholly dependent on express companies for the transportation of their samples. They cannot ship them by mail because even one brick exceeds the weight limit; neither can they ship by freight, because in most instances time is an important factor. Grain samples and hop samples are given special rates, and owing to the nature of shipments of sample brick, this is a very desirable business for the express companies, and the rates are therefore reduced from the merchandise graduated charges to the merchandise pound rates. (20 I. C. C., 582.)

STATE COMMISSIONS.

The Railroad Commission of Louisiana has issued rate bulletin 1 A, containing authorities issued by the commission for changes in rates and new rates from July 1, 1910, to December 31. The authorities are classified according to commodities. The commission has also issued rate bulletin No. 2, containing telephone and telegraph rates authorized by the commission and in effect January 1, 1911.

The New York State Public Service Commission, Second district, has appointed William McClellan of New York as its consulting electrical engineer at a salary of $5,000 a year, to succeed Howard H. Crowell, resigned. Mr. McClellan has been engaged in the electrification of the New York Terminal of the Pennsylvania Railroad, the electrification of the Rochester branch of the Erie Railroad, and as consulting engineer on many other important enterprises.

COURT NEWS.

The Appellate division of the New York supreme court has reversed the decision of the lower courts in the case in which E. O. Goldan had been given judgment for $85,500 against the Delaware & Eastern and F. F. Searing and other directors. The court holds that bonds in the hands of a bona fide holder are not void because they have not been approved by the New York Public Service Commission. A bond salesman, Enthoven, accepted as his commission $85,500 bonds of the Delaware & Eastern, and made an assignment of these bonds to Goldan. The bonds not having been approved by the New York Public Service Commission, Goldan sued the railway company and its directors on the ground that the bonds were void. The court sustains the demurrer of the defendant.

Judge Charles Wolverton of the federal court at Portland, Ore., has rendered a decision by which, if finally sustained, over 2,000,000 acres of land, valued at between $50,000,000 and $75,000,000, and held by the Southern Pacific in central Oregon will, it is said, revert to the government. While the original grant of the land to the Oregon Central in 1866 made no specific requirements as to how the land should be sold, the court held that in granting this land as an aid to railway construction, Congress intended that it should be sold by the railway to bona fide settlers in tracts not greater than 160 acres and at the rate of $2.50 an acre, basing its findings on the terms of a grant made in 1868. As the Southern Pacific, which did not obtain control of the line until several year later, did not take advantage of additional rights secured in the grant of 1868, it traced its title to the original act, which made no specifications as to how the land should be sold. Settlers who occupied the land before the suits of the government were begun gain no advantage by this decision.

Indictments have been brought against D. R. Hanna, Robert L. Ireland of the M. A. Hanna Co., and D. T. McCabe, fourth vice-president of the Pennsylvania Company, and seventeen indictments against the Lake Shore & Michigan Southern, the Pennsylvania, Bessemer & Lake Erie, and New York, Chicago & St. Louis by the Federal Grand Jury, which has been investigating charges of rebating on ore shippers in Cleveland. The three individuals are charged in the indictments with conspiring to violate the Elkins law. A maximum penalty of two years in the penitentiary and a $10,000 fine is provided. D. R. Hanna and D. T. McCabe are indicted on the charge of signing a contract under which the Hanna company is alleged to have promised to rebate to individual shippers the profits of the Ohio & Western Pennsylvania Dock Company, which is also indicted. The dock company was organized by M. A. Hanna & Co., and the docks themselves were leased by the Pennsylvania company to the Hanna interests. One exhibit alone shows the alleged payment of $50,112 as part of the earnings of the dock company to the Carnegie Steel Company. Evidence produced before the Grand Jury is said to show that the railways own the dock companies and lease the docks to operating companies under different names. Testimony was introduced to show that railways arrange for the dock companies to unload vessels and load cars and vice versa, and out of the amounts the railways have paid the dock companies the dock companies have rebated to the shippers sums reaching into the hundreds of thousands of dollars.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

O. L. Dickeson, special inspector of transportation of the Chicago, Burlington & Quincy at Chicago, has been elected vice-president of the White Pass & Yukon Route, the Pacific & Arctic Railway and Navigation Company, the British Columbia Yukon Railway, the British Yukon Railway and the British Yukon Navigation Company, with office at Vancouver, B. C. Mr. Dickeson was born September 18, 1877, near Ottumwa, Iowa, and received his early education in the public schools of Ottumwa. When he was 15 years old he went to Chicago and took a business course under a private tutor, after which he became a clerk for a commercial concern. He began railway work as a stenographer in the transportation department of the Chicago, Burlington & Quincy in January, 1899, and two years later became chief clerk in the same department. He was appointed superintendent of freight and passenger transportation of the lines west of the Missouri river, with office at Omaha, Neb., in 1905, and in December, 1908, was appointed inspector of transportation, with office at Chicago, reporting direct to Vice-President Daniel Willard. Since January, 1910, when Mr. Willard became president of the Baltimore & Ohio, Mr. Dickeson has reported direct to the president of the Burlington.

O. L. Dickeson.

Frank B. Bowes, general traffic manager of the Illinois Central, the Yazoo & Mississippi Valley and the Indianapolis Southern, has been elected vice-president in charge of all traffic, with office at Chicago, Ill. Mr. Bowes was born January 29, 1862, at Chicago. His entire railway career has been with the Illinois Central, where he began as office boy in the general auditor's office on July 1, 1876. A little later he was transferred to the general freight office as clerk, and from 1880 to May 1, 1886, was secretary to the general passenger agent. He was then made general northern passenger agent at Chicago, and in 1894 was transferred to New Orleans as assistant general passenger agent, where he remained until May 1, 1895, when he was appointed general freight agent of the southern lines of the Illinois Central and the Yazoo & Mississippi Valley. He was made assistant traffic manager of both roads, with headquarters at Chicago on January 1, 1903, and on July 1, 1905, was promoted to freight traffic manager. On September 21, 1909, he was chosen general traffic manager of the entire system, which title he retained until his

Frank B. Bowes.

new appointment as above. Mr. Bowes is the first vice-president of the Illinois Central to have jurisdiction solely over traffic matters.

Frank W. Morse, general manager of the Chicago & Alton and Toledo, St. Louis & Western, at Chicago, has been elected vice-president and general manager, with office at Chicago, succeeding George H. Ross, resigned on account of ill health.

F. A. Deverell, auditor of the Cincinnati, Hamilton & Dayton at Cincinnati, Ohio, has been appointed general auditor, in charge of the accounting department, with office at Cincinnati. J. L. Cramer, vice-president and comptroller, with office at Cincinnati, having resigned, that office has been abolished.

Alexander Robertson, vice-president and general manager of the Western Maryland, at Baltimore, Md., has been elected president, succeeding B. F. Bush, who becomes president of the Missouri Pacific and the St. Louis, Iron Mountain & Southern. Mr. Robertson was born at Albany, N. Y., in 1860, and began railway work with the Fitchburg Railroad, now a part of the Boston & Maine, in 1885, serving as brakeman, conductor, general yardmaster, station master and trainmaster respectively until 1897, when he was appointed general yardmaster of the Wabash Railroad at Decatur, Ill., the following year he was promoted to trainmaster, and in September, 1899, was appointed superintendent at Decatur. In August, 1903, he was called East by the Goulds to take charge, as manager, of the operations of the Western Maryland and West Virginia Central & Pittsburg, which were then disconnected properties. He only remained in Baltimore about five months, when he was selected by the Terminal Railroad of St. Louis to operate that property as general manager, which position he held until November 1, 1905, when he was appointed general manager of the unified Western Maryland, with jurisdiction over all departments. In March, 1907, he was elected vice-president of the same road, which position he has held up to the present time.

A. Robertson.

Operating Officers.

Harry Gallwey has been appointed general manager of the Butte, Anaconda & Pacific, with office at Butte, Mont. M. F. Kolbe has been appointed superintendent, with office at Anaconda, Mont.

A. P. Spencer, general agent of the Chicago, Rock Island & Pacific at Amarillo, Texas, has been appointed assistant general manager of the Crosbyton-Southplains Railroad, with office at Crosbyton, Texas.

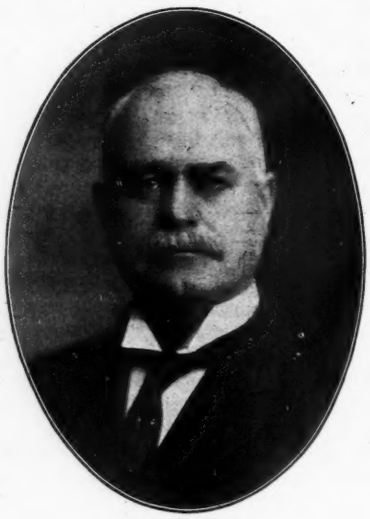
John A. Bower, chief clerk in the office of Superintendent W. H. Anderson of the Louisville & Nashville, has been appointed assistant superintendent of the Kentucky Central division, with office at Paris, Ky.

F. R. Mullen, trainmaster of the Chicago, Burlington & Quincy at Lincoln, Neb., has been appointed trainmaster, with office at McCook, Neb., succeeding A. G. Smart, promoted to superintendent of the Omaha division. R. E. Steele succeeds Mr. Mullen.

W. C. Brown, president of the New York Central & Hudson River, announces that J. H. Hustis, assistant general manager of the Boston & Albany, is to be appointed general manager of the Boston & Albany, with office at Boston, Mass., reporting direct to President Brown.

John A. Shepherd, superintendent of the Maryland division of the Western Maryland, at Hagerstown, Md., has been appointed general manager, with office at Baltimore, Md., succeeding as general manager A. Robertson, vice-president and general manager, who becomes president.

C. J. Phillips, whose appointment as superintendent of the Morris & Essex division of the Delaware, Lackawanna & Western, with office at Hoboken, N. J., has been announced in these columns, was born November 30, 1861, at Washington, Ill. He was educated in the public schools of his native town and at the Oskaloosa (Iowa) College, graduating in the class of 1879. The same year he began railway work as a brakeman on the Chicago, Rock Island & Pacific, since which time he has been consecutively telegraph operator, agent, general agent and general live-stock agent. In 1890 he was appointed division freight agent, at Des Moines, Iowa, remaining in that position until 1900, when he went to the Delaware, Lackawanna & Western as superintendent of the Buffalo division, with office at Buffalo, N. Y., which position he held at the time of his recent appointment as superintendent of the Morris & Essex division of the same company.



C. J. Phillips.

Edward Dailey Levy, whose appointment as assistant general manager of the St. Louis & San Francisco, with office at Springfield, Mo., has been announced in these columns, was born October 16, 1879, at Paris, Texas. He was educated at the public schools of Paris and Dallas, and began railway work in February, 1898, as a stenographer in the office of the Santa Fe Refrigerator Despatch at Chicago. During the next six years he was consecutively stenographer or secretary in either the operating or mechanical departments of the following roads: Michigan Central at Detroit, Mich.; Chicago, Milwaukee & St. Paul at Chicago; Atchison, Topeka & Santa Fe, first at Chicago and then at Needles, Cal.; Fort Worth & Denver City at Fort Worth, Texas; Mexican Central at the City of Mexico; Kansas City Southern at Texarkana, Texas; Gulf, Colorado & Santa Fe at Galveston, Texas. He was then made senior clerk in the general manager's office with the latter road, and in May, 1904, was appointed chief clerk to the general superintendent. In August, 1906, he went with the St. Louis & San Francisco as assistant superintendent of car service at Springfield, and was promoted to superintendent of transportation in June, 1907, from which office he was recently promoted to assistant general manager as above.

E. D. Levy.

Theodore Ensel, superintendent of telegraph of the Pere Marquette at Detroit, Mich., has been appointed superintendent of the Grand Rapids district, with office at Grand Rapids, Mich.,

succeeding J. S. Pyeatt, resigned to accept service with the St. Louis & San Francisco. William M. Hayes succeeds Mr. Ensel. It was incorrectly stated in our issue of last week that Mr. Pyeatt had been superintendent at Detroit.

Donald L. Sommerville, who has been appointed assistant superintendent of the New York Central & Hudson River, with office at Jersey Shore, Pa., as has been announced in these columns, was born October 17, 1870, at Bellefonte, Pa. He was educated in the Pennsylvania State College, and began railway work in December, 1890, in the engineering department of the Beech Creek Railroad, which was a leased line of the New York Central, but was operated independently until May, 1899. He was appointed supervisor of bridges and buildings on the Pennsylvania division of the New York Central, in May, 1899, remaining in that position until January, 1902. Mr. Sommerville was then appointed division engineer of the Rome, Watertown & Ogdensburg division, and was later transferred to the Pennsylvania division, and then to the Western division, which position he held at the time of his recent appointment as assistant superintendent.

Traffic Officers.

W. M. Kirkpatrick, general freight agent of the Canadian Pacific, at Toronto, Ont., has been transferred to Montreal, Que.

W. R. Sibley has been appointed agent of the Erie Despatch, with office at Columbus, Ohio, succeeding Theodore Davis, resigned.

E. P. Swan has been appointed general agent, freight department, of the Chicago, Burlington & Quincy, with office at Detroit, Mich.

D. A. O'Brien has been appointed a traveling freight agent of the Trinity & Brazos Valley, with office at Kingsville, Texas, a new office.

Frank L. Salisbury has been appointed a contracting agent of the Louisville & Nashville, with office at Knoxville, Tenn., succeeding R. S. Cooley, resigned.

Warren J. Lynch, passenger traffic manager of the New York Central Lines west of Buffalo, N. Y., has resigned to go to the American Steel Foundries Co., effective May 1.

John L. Sullivan, traveling freight agent of the Chicago Great Western at Des Moines, Iowa, has been appointed assistant general freight agent of the Fort Dodge, Des Moines & Southern, with office at Chicago.

W. M. Hardin, commercial agent of the Iowa Central and the Minneapolis & St. Louis at Kansas City, Mo., has been appointed commercial agent, with office at St. Louis, Mo., succeeding Raymond Kelly, resigned to engage in other business.

T. P. Hinchcliff, soliciting freight agent of the Chicago, Burlington & Quincy at Cleveland, Ohio, has been appointed a traveling freight agent, with office at Cleveland, succeeding W. S. Dewey, transferred. J. B. Sanford succeeds Mr. Hinchcliff.

T. J. Kizer, commercial agent of the Cleveland, Cincinnati, Chicago & St. Louis, at Terre Haute, Ind., has been appointed a soliciting freight agent, with office at Indianapolis, Ind., succeeding L. J. Blaker, resigned. W. W. Baum succeeds Mr. Kizer.

N. G. Spangler, division freight agent of the Baltimore & Ohio Southwestern at Chillicothe, Ohio, has been appointed also division freight agent of the Cincinnati, Hamilton & Dayton, with office at Chillicothe, and the office of division freight agent of the latter road at Toledo, Ohio, has been abolished.

E. M. Burns, traveling freight agent of the Chicago Great Western at Tacoma, Wash., has been appointed general agent of the freight department, with office at Portland, Ore., succeeding G. A. Cooper, resigned to engage in other business. A. C. Keyes, contracting freight agent at Portland, succeeds Mr. Burns.

Engineering and Rolling Stock Officers.

H. A. Hatch has been appointed a division engineer of the Atchison, Topeka & Santa Fe, with office at Chanute, Kan., succeeding M. N. Wells.

Carl Stradley, locating engineer of the Oregon Short Line, has been appointed chief engineer, with office at Salt Lake City, Utah, succeeding William Ashton, resigned.

E. E. Mullins, mechanical engineer of the Northern Railway Company (Costa Rica), has been appointed superintendent of motive power, with office at Limon, Costa Rica, succeeding W. H. Sample, resigned.

J. N. Mowery, who has been appointed master mechanic of the Western division of the New York, New Haven & Hartford, with office at Waterbury, Conn., as previously announced in these columns, began railway work as a special apprentice on the Chicago, Burlington & Quincy in July, 1899, remaining with that company until May, 1900. He then held various positions until his appointment as mechanical engineer of the Lehigh Valley on February 12, 1906. Mr. Mowery remained in this position until November, 1909, when he was appointed assistant master mechanic of the same company, and was promoted to master mechanic of the Auburn division in June, 1910, which position he held until his recent appointment as master mechanic of the New York, New Haven & Hartford.

OBITUARY.

S. A. Kendig, colonization agent of the Gulf, Colorado & Sante Fe, with office at Galveston, Tex., died at Temple, Tex., on April 19.

W. H. Bush, commercial agent of the Pacific Coast Steamship Company, with office at Nome, Alaska, died at his home in Seattle, Wash., on April 16. Mr. Bush was a brother of B. F. Bush, recently elected president of the Missouri Pacific.

John Dennis Keiley, electrical engineer of the New York Central & Hudson River, died of pneumonia at his home, 58 Arthur street, Yonkers, N. Y., on April 21. The engineering profession thereby lost one of its most resourceful leaders, who has left an enviable record in the pioneer field of railway electrification. Mr. Keiley was the son of Major J. D. Keiley, a director of the Brooklyn Rapid Transit. He was born in Brooklyn, February 6, 1871, and educated in the Christian Brothers' School of that city, St. Francis Xavier College, and John Hopkins University, where he took a four years' scientific course, specializing in electrical engineering. Upon finishing this course, in 1893, he undertook some civil engineering work in South Carolina. In 1897 Mr. Keiley entered the service of the Brooklyn Rapid Transit in connection with the reconstruction of the Brighton Beach Railroad, and after a few months he was made assistant engineer. His natural work, however, was in the electrical field. When train movement tests were inaugurated by the Brooklyn Heights Railroad he invented an instrument to record automatically the movement of the trains and simultaneously the readings of electrical instruments. This device was called the Keileyograph. Mr. Keiley's excellent record led to his appointment as assistant master mechanic, in which capacity he acted as technical advisor to the vice-president of the Brooklyn Rapid Transit, a position which he retained until 1903. When the electric traction commission of the New York Central was organized, Mr. Keiley was appointed assistant electrical engineer. He entered upon this work February 1, 1903, and immediately began to help solve the problems which attended the first great trunk line electrification. He brought to this work enthusiasm, a broad experience and a clear, logical mind, which was the inspiration of all with whom he was associated. His familiarity with civil, mechanical and electrical engineering, in addition to his high mathematical talent, were of the greatest assistance to the commission, and in recognition of his services he was appointed electrical engineer in 1906. The dominant characteristic of Mr. Keiley's work was intellectuality. Dispassionate logic settled every problem that confronted him. Nothing was ever slighted, nothing ever decided by prejudice. Among Mr. Keiley's other inventions are a self-ventilated armature and a hand brake system for street cars. He also developed many of the practical details of the New York Central type of under-contact third rail. His most valuable contribution to the art of electric railroading was the circuit breaker house system of third rail connection which has been the means of saving vast sums in feeder copper. In 1907 Mr. Keiley, collaborating with Prof. S. W. Ashe, brought out a book entitled "Electric Railways," which is largely used in technical colleges. Mr. Keiley was a member of the Engineers', Transportation, and New York Railroad Clubs.

Railway Construction.

New Incorporations, Surveys, Etc.

Atchison, Topeka & Santa Fe Coast Lines.—A contract is said to have been given to George West, San Bernardino, Cal., for reconstructing the roadbed between Fresno and Merced, which are 58 miles apart.

Atlantic, Waycross & Northern.—An officer writes that this company's plans call for a line from St. Marys, Ga., on the Atlantic seacoast, northwest via Waycross, Nicholls, Broxton and Abbeville to either Perry or Ft. Valley, thence to Atlanta, about 220 miles. The company now operates a 11-mile line from St. Marys to Kingsland. It is expected that contracts for the new work will be let in two or three months. The work will be comparatively light earth work, and there will be one trestle over Satilla river. Maximum grades will be 1.5 per cent. The line is being built to carry fertilizer, cotton, fruit, lumber, turpentine, rosin and general merchandise. L. Johnson, president, St. Marys, and Dean G. Edwards, chief engineer, Waycross.

Canadian Northern.—This company is asking for bids May 12, it is said, to build the section through British Columbia between Hope and the crossing of the North Thompson river at Kamloops, 163 miles. The work will be let in four sections; it must be completed within two years, and will include tunnels aggregating 2¾ miles, the longest being 2,400 ft. It is expected that work along the Frazer river canyon will cost from $80,000 to $100,000 a mile. An officer is quoted as saying that the Canadian Northern proper now has about 4,000 miles of track laid, of which 600 miles is not yet in operation. In addition there are allied lines, disconnected links of the system amounting to about 2,000 miles, which will be absorbed by the Canadian Northern as soon as connected up, which will require the construction of some 1,700 miles more.

Central Vermont.—See Grand Trunk.

Chicago, Milwaukee & Puget Sound.—A contract is said to have been given to Bates & Rogers, contractors, of Chicago and Spokane, Wash., for building a tunnel in Spokane, to be used by the railway in entering the terminal building. The tunnel will cost about $600,000. Additional contracts for terminal work will be let within a few weeks.

Crosbyton & South Plains.—This company recently began operating the line from Lubbock, Texas, east to Crosbyton, 40 miles. It is understood that work will be carried out on the proposed extension from Crosbyton to Spur, 35 miles. John A. Knox, chief engineer, Lubbock. (December 16, p. 1167.)

Grand Trunk.—According to press reports the Central Vermont will at once begin work on 50 miles of new line in the Connecticut valley in Vermont, to connect the gap between Windsor, Vt., and Brattleboro. This new line will give the Grand Trunk—Central Vermont, a through route over its own tracks from Montreal, Que., to New London, Conn. (March 10, p. 478.)

The Rhode Island legislature having granted authority to the Southern New England Railway to change its charter to provide for proper entrance facilities to the state docks to be built at Providence, R. I., the Grand Trunk will build about 70 miles of new line from Palmer to Providence. (March 10, p. 478.)

Gulf, Texas & Western.—An officer writes that this company, which operates a line from Jacksboro, Tex., west to Seymour, 75 miles, is planning to build an extension from Jacksboro, east, also another extension from Seymour, west, but it is undecided to what points the extensions will be built. The plans have not yet been completed and it has not been determined when bids will be asked for the work.

Houston Bay Shore Traction.—Contracts have been given to the W. E. Ule Construction Company, it is said, to build an interurban line from Houston, Texas, east to La Porte and Sylvan Beach, about 25 miles. A. F. Irwin, Houston, is right-of-way agent for the company.

Lake Erie & Pittsburgh.—See Lake Shore & Michigan Southern.

Lake Shore & Michigan Southern.—An officer writes that no orders have been given to build an extension of the Lake Erie & Pittsburgh. The line is completed from Cleveland, Ohio, southeast to a junction with the Pennsylvania Railroad at Ravenna, but as yet no use is being made of the line. No work has been done between Cleveland and Lorain. The original plans called for building in the interests of the Lake Shore & Michigan Southern and the Pennsylvania Railroad, from Lorain, southeast to Youngstown, 91 miles, with a branch to Cleveland, 29 miles.

Missouri, Arkansas & Gulf.—According to press reports, all the right-of-way has been secured and contracts have been let for building this line. The projected route is from Rolla, Mo., south to Bakersfield, 125 miles. (April 21, p. 970.)

Nacogdoches & Southeastern.—An officer writes that this company, which operates a line from Nacogdoches, Texas, to Dockville, 13 miles, has recently finished work on an extension of six miles, but does not expect to begin operation over that section until about June 1. Regarding the reports that an extension is to be built to Chireno, Texas, the matter is still in an unsettled state, but a decision will probably be reached soon.

Nevada-California-Oregon.—According to press reports, the extension of this road from Alturas, Cal., north, will be built along the east side of Goose lake to Lakeview, Ore., this coming summer. Grading has been finished to within a few miles of Davis, Cal. (January 27, p. 183.)

Northern Pacific.—According to press reports, this company will extend the branch line from Mott, N. D., west to Miles City, Mont., this coming summer.

Ocilla Southern.—A contract has been given to R. S. Talmadge, it is said, for building an extension from Alapaha, Ga., south to Nashville, about 15 miles.

Oregon Short Line.—Work has begun on a connection of the main line of the Oregon Short Line, it is said, with the grade of the San Francisco, Idaho & Montana. The latter was projected about four years ago, as the Golden Gate, and was to run from Caldwell, Idaho, to Winnemucca, Nev., where connection was to be made with the Southern Pacific.

Pennsylvania Lines West.—The Cleveland & Pittsburgh division is securing property, it is said, in the central part of Columbiana county, Ohio. It is understood that the company proposes to build a low grade cut-off from Smiths Ferry, Pa., near the Ohio-Pennsylvania state line, through Columbiana county, to Kensington, Ohio.

Philadelphia & Western (Electric).—According to press reports, this company will build an extension from Villanova, Pa., to Norristown. A contract for the work has been given to the Stone & Webster Engineering Corporation, Boston, Mass. It is understood that the construction work will cost about $2,000,000.

Sacramento Valley West Side Electric.—Organized in California, with headquarters at Willows, Cal., to build from Woodland, north to Kennett, about 50 miles. C. L. Donohue and E. L. Sisson are interested.

San Francisco, Idaho & Montana.—See Oregon Short Line.

Southern New England.—See Grand Trunk.

Tidewater & Southern (Electric).—This company, which is now building from Stockton, Cal., southeast, to Modesto, about 30 miles, will extend the line southeast to Merced, about 25 miles. J. H. Wallace, president, Stockton.

Washington Roads.—The Washington Water Power Company has given a contract to Boynton, Church & McKoy, Spokane, Wash., it is said, to build from Springdale to Long Lake, 22 miles. It is expected that the line will be finished by September 1. (See Springdale & Long Lake, March 31, p. 814.)

The Buenos Aires & Pacific Railway has opened to public service the railway line from Buena Esperanza to Guadales, a distance of 160 miles.

Railway Financial News.

Albuquerque Eastern.—M. A. Otero has been appointed receiver of this company, which is controlled by the same interests that control the New Mexico Central.

Chesapeake & Ohio.—This company has sold to Kuhn, Loeb & Co., and the National City Bank, both of New York, $16,000,000 4½ per cent. notes. These notes are part of an authorized issue of $25,000,000 notes, which are secured by the deposit of bonds of the recently authorized issue of $125,000,000 5 per cent. 20-year bonds. It is understood that the bankers have resold the notes at 99½.

Eagles Mere Railroad.—G. W. Kipp has been appointed co-receiver of this property, which was recently placed in the hands of A. L. Geyelin as receiver. The company has outstanding $80,000 5 per cent. bonds and $20,000 4 per cent. bonds. A plan of reorganization has been formulated calling for the issue of $100,000 new 5 per cent. bonds and $40,000 stock.

Crosbyton & South Plains.—This company, which has recently completed a line from Lubbock, Texas, to Crosbyton, has asked the Texas Railroad Commission to make an examination of its road with the purpose of making a valuation against which to issue bonds.

Grand Trunk.—Stockholders have voted to authorize the directors to make a mortgage securing $30,000,000 bonds, guaranteed as to interest by the Grand Trunk, with a lien on the Grand Trunk Western.

Gulf, Texas & Western.—This company has asked the Texas Railroad Commission for authority to issue bonds on 25 miles of road from Megargel to Seymour. The road runs from Jacksboro to Seymour, 75 miles, and $1,700,000 bonds have been issued on the 50 miles of road from Jacksboro to Megargel.

Kansas City & Memphis.—F. J. Lisman & Co., New York, have bought $540,000 new 5 per cent. mortgage bonds of May 1, 1911-1961. The company is now operating about 30 miles of road and has under construction an additional 26 miles of road.

Lake Erie & Pittsburgh.—Stockholders are to vote May 19 on the question of increasing the capital stock from $100,000 to $6,000,000, and authorizing a mortgage to secure $15,000,000 bonds. The road is to run from Lorain, Ohio, to Youngstown, 91 miles, with a branch to Cleveland, 29 miles. The company now has in operation about 20 miles of line from Cleveland, east.

Long Island.—Holders of the $600,000 Long Island City and Flushing first mortgage 6 per cent. bonds due May 1, 1911, are offered the privilege of exchanging these bonds at par for refunding mortgage 4 per cent. bonds, due 1949, guaranteed principal and interest by the Pennsylvania Railroad, at 97.

Louisville & Nashville.—J. P. Morgan & Co., New York, have bought $10,000,000 first mortgage Atlanta, Knoxville & Cincinnati division 4 per cent. bonds, from the Louisville & Nashville.

Missouri, Kansas & Texas.—This company has asked the Board of Railway Commissioners of Kansas for authority to issue $107,000,000 bonds, of which $82,000,000 will be for refunding and $25,000,000 will be sold to pay for improvements. This about covers the balance of $125,000,000 bonds recently authorized by the stockholders, the railway commissioners having already authorized $17,131,000 of this issue.

Missouri Pacific.—James Speyer and H. I. Miller were elected directors, succeeding Paul M. Warburg and Cornelius Vanderbilt, whose resignations were mentioned last week. Frank Vanderlip, who was mentioned last week as likely to be elected a director, refused to accept election.

New Mexico Central.—Judge McFie has denied the petition of creditors to have C. C. Murray, of Pittsburgh, removed from the receivership. The court ruled that none of the charges brought against Mr. Murray were proved. Mr. Murray is receiver of the Albuquerque.

New York Connecting Railroad.—Lewis Cass Ledyard, a director of the New York Central & Hudson River, and of the New York, New Haven & Hartford, has been elected a director also of the New York Connecting Railroad, succeeding H. A. Fabian, manager of purchases of the New York, New Haven & Hartford.

New York, New Haven & Hartford.—This company will, on July 1, assume half the annual deficit of Boston & Albany. When the Boston & Albany property once more earns an operating surplus over its guaranteed 8 per cent. dividend, it must divide this surplus with the New Haven. The Boston & Albany will be operated from Boston (See Railway Officers), except that W. C. Brown, president of the lessee road, will remain president.

The New Haven will have trackage rights over the Boston & Albany, between South Framingham and Boston, between Ashland and South Framingham, between Ludlow and Springfield, and between Pittsfield and North Adams.

The lease of the B. & A. to the New York Central & Hudson River has 88 years to run, and it provides for a guarantee by the N. Y. C. of 8 per cent. dividends on the $25,000,000 stock of the B. & A. The operations of the B. & A. are included with the other leased lines in the New York Central & Hudson River's annual report, and are not shown separately. (See editorial comments elsewhere.)

This company has sold to J. P. Morgan & Co., New York, an issue of $12,300,000 4 per cent. 50-year Central New England bonds which the bankers will soon offer for subscription. These bonds are part of an authorized issue of $25,000,000 and are sold to refund several different issues, total of which is practically the same amount as the bonds to be sold. Several of the issues to be refunded, however, carry higher than the 4 per cent. rate on the new bonds, so that the saving in interest charges through refunding will be about $125,000 per annum.

Of the $12,200,000 bonds to be refunded, about $9,000,000 are held in the New Haven treasury, having been bought during the course of the last six or eight years.

Theodore N. Vail, president of the American Telephone & Telegraph Company, has been elected a director of the New Haven, succeeding Nathaniel Thayer, deceased.

Philadelphia & Reading.—Stockholders have approved the increase of stock from $20,000,000 to $45,000,000. The new stock will be issued to the Reading Company to reimburse it for the payment of prior lien and consolidated mortgage bonds of the old Philadelphia & Reading Railroad, and the stock will be deposited as collateral under the Reading Company's general mortgage bonds.

St. Louis & San Francisco.—William Salomon & Co., New York, and G. H. Walker & Co., St. Louis, have bought $5,000,000 New Orleans, Texas & Mexico division first mortgage 5 per cent. bonds. Of the total authorized issue of $50,000,000, $21,000,000 have been issued as 5 per cent. bonds, which includes the $5,000,000 just sold and $5,000,000 have been sold in France, bearing interest at 4½ per cent., and $10,000,000 are pledged as collateral for notes due March 1, 1913.

St. Louis Southwestern.—See Stephenville North & South Texas.

Stephenville, North & South Texas.—The Guaranty Trust Company, New York, has bought $2,000,000 first mortgage 30-year 5 per cent. bonds, guaranteed by the St. Louis Southwestern.

Plans for the rebuilding of the Ofoten Railway from Hundalen, Norway, to Kapparaasen, Sweden, have been submitted to the Swedish railway authorities. By the route proposed the total length of the line would be shortened by nearly four miles, the number of curves would be reduced considerably, and the traffic during the winter would not be obstructed by snow, as often happens at the present time, while the working expenses would be reduced by about $85,000 a year. The rebuilding will embrace about 15 miles of single track, the cost of which is estimated at about $2,073,500, while the largest tunnel would cost about $1,150,000. As the shipments of iron ore are shortly to be largely increased, the carrying capacity of the railway will have to be improved, and it is therefore considered very probable that the project will be approved of.

Supply Trade Section.

The Southern Car Company, High Point, N. C., will increase its capital stock from $100,000 to $300,000.

The Investment Trust Company, Montreal, Que., has bought a large block of the 6 per cent. bonds of the Canadian Car & Foundry Company, Montreal.

The Western Electric Company, Chicago, has received an order to furnish telephones and selectors for use on train despatching circuits on the Duluth & Iron Range, the length of road aggregating 123 miles.

The Kirby Equipment Company, Chicago, has moved its offices and the Chicago office of the Globe Seamless Steel Tubes Company, Milwaukee, Wis., from the Railway Exchange to the Peoples' Gas building.

The Call Switch & Frog Company, Denver, Colo., a subsidiary of the Call Switch Company, has been incorporated with $50,000 capital, fully paid, to make the Call type of switches and track supplies. The plant which the company is building at Denver is now nearing completion.

The Delaware, Lackawanna & Western, mentioned in the *Railway Age Gazette* of March 31 as specifying Nathan sight feed lubricators for the 35 new locomotives ordered from the American Locomotive Company, advises that Detroit bull's eye lubricators will be used on the 15 consolidation locomotives, and Nathan bull's eye lubricators on the passenger, freight and switching locomotives.

John C. Anderson, of Westinghouse, Church, Kerr & Company, Pittsburgh, Pa., has resigned to become mechanical engineer in the sales department of the Pressed Steel Car Company, Pittsburgh, Pa., with office in New York, effective May 1. Mr. Anderson is a graduate of the Sheffield Scientific School of Yale University, and has been on the Northern Pacific and Baltimore & Ohio. He is a son of the late General Adna Anderson, formerly vice-president and chief engineer of the Northern Pacific.

Morgan T. Jones, president and inspecting engineer of the American Bureau of Inspection and Tests, Chicago, has resigned to engage in the same line of work under the firm name Morgan T. Jones & Co. He will open an office May 1, in the Monadnock block, Chicago. George W. Greene, mechanical engineer of the American Bureau of Inspection and Tests, will succeed Mr. Jones as inspecting engineer, and E. C. McMillan will succeed Mr. Greene.

The Roberts & Schaefer Co., Chicago, has closed a contract with the Queen & Crescent for a 500-ton reinforced concrete and steel main line coaling station to be designed and built at Montlake, Tenn., immediately. This company has also taken a contract recently for a 200-ton frame construction coaling station for the St. Louis & San Francisco at Palos, Ala., and a contract for a 500-ton main line steel and frame construction Holmen coaling station for the Cleveland, Cincinnati, Chicago & St. Louis at Greensburg, Ind.

Warren J. Lynch, passenger traffic manager of the New York Central Lines west of Buffalo, has resigned to go with the American Steel Foundries, Chicago, effective May 1. At the meeting of the directors in May, he will be elected fourth vice-president of that company, with office at New York. Mr. Lynch entered railway service in 1883 as clerk in the auditor's office of the Cleveland, Columbus, Cincinnati & Indianapolis (now the Cleveland, Cincinnati, Chicago & St. Louis) at Cleveland, Ohio. In March, 1896, he was appointed assistant general passenger agent of that road at St. Louis, Mo., and the following April was transferred to Cincinnati, Ohio, with the same title. He held this position until May, 1899, when he was made general passenger and ticket agent of the same road, which had in the meantime become the Cleveland, Cincinnati, Chicago & St. Louis. On December 1, 1905, he was made passenger traffic manager of the New York Central Lines west of Buffalo, including the Lake Shore & Michigan Southern, the Michigan Central, the Cleveland, Cincinnati, Chicago & St. Louis, the Lake Erie & Western and the Indiana, Illinois & Iowa (now part of the Chicago, Indiana & Southern). Later his jurisdiction was extended over the Cincinnati Northern, the Indiana Harbor Belt, the Pittsburgh & Lake Erie, the Toledo & Ohio Central, and the Zanesville & Western.

TRADE PUBLICATIONS.

Pennsylvania Railroad.—This company has published a 100-page illustrated booklet called Increase the Crop per Acre, for distribution throughout the territory along its lines. This booklet deals with the use of dynamite on the farm and tells how the best results may be obtained.

Drills.—The Ingersoll Rand Co., New York, has just issued bulletins 4,003 and 4,016, describing and pointing out the advantages of its Little Giant rock drills and its Imperial valveless telescope hammer drills, respectively. Illustrations, diagrams and tables are included.

Railway Motors.—Bulletin No. 4,822, of the General Electric Company, Schenectady, N. Y., illustrates and describes its GE-98 railway motor for heavy city and suburban service. The motor is rated at 50 h. p. The bulletin contains dimension diagrams, characteristic curves, and a table of schedule speeds.

Telephone Line Construction.—W. N. Mathews & Bro., St. Louis, Mo., have published the third edition of their telephone line construction book, under the title, "From the Bottom of the Hole to the Top of the Pole." The book includes valuable data for designing and constructing pole lines, and several specially written articles on subjects of interest to telephone men.

Concrete Mixers.—Catalog 3, Series M, of the Municipal Engineering & Contracting Co., Chicago, gives interesting information on the theory and practice of mixing concrete, the construction of the Improved Cube Mixer and a number of large installations of these mixers. It is well illustrated with photographs and sketches of possible applications of the cube mixer.

Steam Turbines and Generators.—The Allis-Chalmers Company, Milwaukee, Wis., has issued bulletin No. 1079 superseding bulletin No. 1054, on steam turbines and generators. It includes descriptions of the principles of the Parsons turbine and of the machines of that type built by the company. The illustrations include numerous installations of turbines and turbo-generators.

RAILWAY STRUCTURES.

ABBOTTSFORD, B. C.—The Canadian Pacific has given a contract to A. D. McQuarrie, Vancouver, B. C., for putting up a station at Abbottsford.

BAYVIEW, WASH.—The Spokane International has given a contract to H. J. Skinner, Spokane, Wash., for putting up a station at Bayview, which is at the southern end of lake Pend d'Oreille.

CANAL DOVER, OHIO.—The Baltimore & Ohio will build a new freight yard to replace the yard at Holloway, Ohio.

COUNCIL BLUFFS, IOWA.—The Chicago, Rock Island & Pacific plans to add to its yards and to rebuild the freight house recently burned. The estimated cost is between $200,000 and $300,000.

DUNSMUIR, CAL.—The Southern Pacific will enlarge its roundhouse, also the station at Dunsmuir.

FISHKILL LANDING, N. Y.—The New York Central has plans made for building a $50,000 station.

GRAND ISLAND, NEB.—The Chicago, Burlington & Quincy is asking bids for a pressed brick passenger station, with tile floor, enamel brick wainscoting, hard plaster walls and ceiling, slate roof, hot water heat, and electric light.

GREENSBURG, IND.—See Montlake, Tenn.

GREENWOOD, B. C.—The Canadian Pacific will build a steel

bridge, it is said, at Greenwood during the coming summer, at a cost of $60,000.

Knoxville, Ia.—The Chicago, Burlington & Quincy will build a pressed brick passenger station.

Lyons, Ore.—The Corvallis & Eastern has been ordered to build a station, it is said, at Lyons, in Linn county.

Merritt, B. C.—The Canadian Pacific has given a contract to J. Boch, Merritt, for putting up a new freight house at Merritt.

Montlake, Tenn.—The Queen & Crescent has given a contract to the Roberts & Schaefer Co., engineers and contractors, Chicago, for a 500-ton reinforced concrete and steel coaling station. The same contractors will also put up a coaling station of frame construction for the St. Louis & San Francisco, at Palos, Ala., and in March were given a contract by the Cleveland, Cincinnati, Chicago & St. Louis for putting up a 500-ton Holmer coaling station of steel and frame construction, at Greensburg, Ind.

Moulton, Ia.—The Wabash will double the capacity of its switching yards and enlarge the roundhouse from six to twelve stalls.

Mount Hope, N. Y.—The New York Public Service Commission, Second district, has ordered the elimination of the grade crossings of the Erie Railroad at county highway No. 313 in the town of Mount Hope, Orange county. The highway is to be carried over the grade of the railway by means of an overhead steel bridge of plate girder construction. A temporary crossing for the accommodation of the public shall be maintained during the construction of the new crossing and its approaches.

New Westminster, B. C.—The Canadian Pacific has given a contract to C. Tossell, New Westminster, for building an addition to the station at that place.

Norfolk, Va.—The Norfolk & Western, the Norfolk Southern and the Virginian Railway have completed arrangements for building a union station in Norfolk at an initial cost of about $1,000,000, with plans for a $1,000,000 addition. The building will be eight stories high, the upper floors being designed for offices. Bonds to the amount of $1,000,000 will be sold to provide for the construction. Bids will be called for soon. (February 11, p. 332.)

Omaha, Neb.—The Chicago, Burlington & Quincy will build a freight house, 40 ft. x 750 ft., of brick and steel construction, second story over 250 ft., for offices, the estimated cost being $175,000.

Palos, Ala.—See Montlake, Tenn.

Port Huron, Mich.—The Pere Marquette will erect a roundhouse to cost about $30,000.

Portland, Ore.—The Oregon-Washington Railroad & Navigation Company, it is said, has agreed to build a station to cost $100,000 on the east side of the city of Portland, if certain streets are vacated.

The Oregon-Washington Railroad & Navigation Company has started work, it is said, on a new viaduct across the Willamette river at the foot of Glisan street, Portland. This is to be a double deck structure, the lower level is to be used by the railway company, and the upper level for highway traffic.

San Saba, Texas.—The Gulf, Colorado & Santa Fe has given a contract to Chas. L. Ryals, Galveston, Texas, for building a pressed brick passenger and freight station.

Spokane, Wash.—The Great Northern has plans made for building an addition to the station at Spokane, at a cost of $10,000.

Stockton, Cal.—The Southern Pacific will build a division headquarters and freight shed 680 ft. long, to cost $175,000.

Tampa, Fla.—A contract for building the Tampa union station, it is said, has been given to the King Construction Company. The plans call for a brick and stone building.

Tyler, Texas.—The St. Louis Southwestern of Texas will build a $12,500 pressed brick, stone trimmed, passenger and freight station.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Midland Valley is in the market for passenger locomotives.

The Southern Railway has ordered 50 locomotives from the Baldwin Locomotive Works, 23 switching locomotives from the Lima Locomotive & Machine Company, and 20 passenger locomotives from the American Locomotive Company.

The Marshall & East Texas, mentioned in the *Railway Age Gazette* of April 21, in an unconfirmed item, as having bought two 75-ton locomotives from the Kilby Locomotive & Machine Company, has ordered one, which will be a rebuilt one.

The Georgia & Florida has ordered 2 ten-wheel locomotives from the Baldwin Locomotive Works. The dimensions of the cylinders will be 19 in. x 26 in., the diameter of the driving wheels will be 56 in., and the total weight in working order will be a little over 150,000 lbs.

The Pere Marquette, mentioned in the *Railway Age Gazette* of March 24 as having ordered 50 locomotives from the American Locomotive Company, has changed this order. Instead of 35 consolidation locomotives with 22 in. x 30 in. cylinders and total weight of 215,000 lbs. in working order, as originally ordered, there will be only 10. The remaining 25 consolidation locomotives will be of a heavier class and will be equipped with superheaters. The dimensions of the cylinders will be 25 in. x 30 in., the diameter of the driving wheels will be 57 in., and the total weight in working order will be 236,000 lbs.

CAR BUILDING.

The Canadian Northern is said to be in the market for 350 freight cars. This item is not confirmed.

The New York Central Lines are in the market for 7 coaches for the Lake Shore & Michigan Southern.

The Illinois Central is said to be in the market for 94 all-steel passenger cars. This item is not confirmed.

The United Fruit Co., Boston, Mass., has ordered 50 twenty-five-ton steel cars from the Youngstown Car Manufacturing Company for use in Costa Rica.

The Spokane, Portland & Seattle, mentioned in the *Railway Age Gazette* of April 14, in an unconfirmed item as having ordered 14 baggage and mail cars, has ordered this equipment.

The Chicago, Milwaukee & St. Paul reported in the *Railway Age Gazette* of April 14 as negotiating with the American Car & Foundry Company for 8 baggage cars, has ordered this equipment from this company.

The Southern Railway has ordered 35 coaches from the Harlan & Hollingsworth Corporation, 10 combination passenger and baggage cars from the St. Louis Car Company, and 20 steel underframe postal cars from the American Car & Foundry Company.

IRON AND STEEL.

The San Antonio & San Jose Interurban, San Antonio, Texas, is in the market for 150 tons of 50-lb. or 60-lb. rails.

The Baltimore & Ohio has ordered 2,500 tons of rails from the Carnegie Steel Company, 2,500 tons of rails from the Illinois Steel Company and 2,000 tons from the Pennsylvania Steel Co.

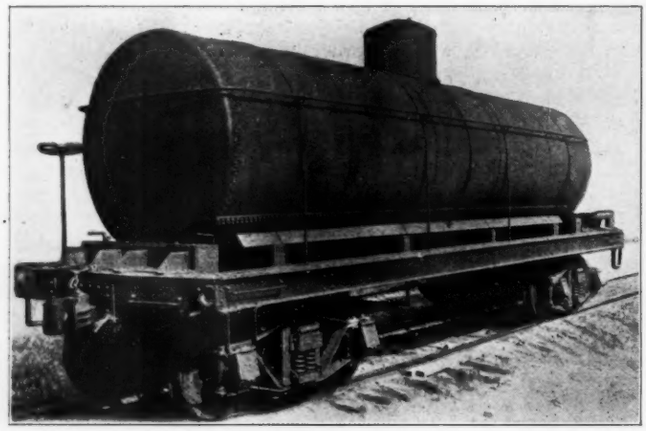
General Conditions in Steel.—The steel industry shows little change. New orders average about 30,000 tons a day and the Steel Corporation is operating at about 68 per cent. of its capacity. Some large orders are expected before the end of the month, which will probably bring the average of daily orders for April to about 33,000 tons, as compared with 35,500 tons for the month of March.

SIGNALING.

The General Railway Signal Company has the contract for automatic signals on the Cumberland Valley between Mechanicsburg and mile post No. 27; between Shippensburg and Chambersburg, and for two other sections, aggregating 44 miles. In this installation alternating current will be used for the track circuit, and the feed wire will supply not only the current necessary for the operation and control of the signals, but also for lights in the passenger stations along the line These are the signals referred to in the last paragraph of the article published in this column, April 14, page 930.

Kennicott Tank Cars.

The shops of the Kennicott Company at Chicago Heights, Ill., have been further enlarged by the erection and equipment of a special shop for the construction of steel frame tank cars and a tank car specialist of wide experience has been employed to direct this work. The tank car shown herewith was recently completed for a western private car line. It conforms to the requirements of the M. C. B. standards, having four steel longitudinal sills and a substantial head block held by deep angles riveted to a steel plate, which is the top member of the end sill. This construction is shown plainly in the illustration. The interior of the tank is provided with a heater for handling such commodities as lard and molasses and other heavy viscous liquids. The truck is of the usual diamond type with heavy arch bars, steel channel transoms and Simplex bolsters. The



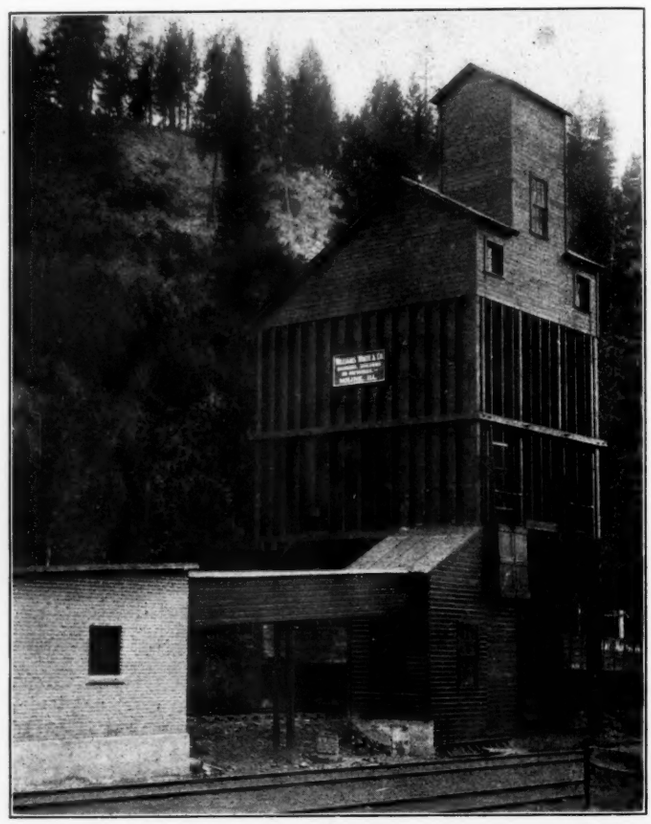
Kennicott Tank Car.

equipment includes Westinghouse air brakes and steel couplers with the Cardwell draft gear. The principal dimensions are: Length over end sills, 31 ft. 6 in.; width over side sills, 8 ft. 10 in.; length of truck, 27 ft.; diameter of tank, 7 ft.; height over all, 13 ft. 6½ in.

Locomotive Coaling Chute.

One of the first builders of coal chute equipment in this country were Williams, White & Company, Moline, Ill. During the last 23 years they have filled orders for 9,845 sets of fixtures. Their gravity type station is well known, and was widely used before the development of the mechanical plant. The illustration shows a small station of the mechanical type designed and built by this company. The track hopper bucket pits and foundations are of reinforced concrete. Coal is dumped from drop-bottom cars directly into a track hopper, and is delivered to a bucket through a steel gravity feeder or measuring box, which is placed in the opening between the track hopper and the bucket pit. This apparatus consists of a steel box with an inclined bottom, which rests on steel beams built into the side walls of the bucket pits. It has an undercut gate at the upper end, and an apron at the lower end hinged to the bottom plate. The apron is connected to the gate arms with steel links, which causes a reciprocating action between them. When the gate opens the apron closes, the movement being effected by the movement of the bucket. When the bucket descends the steel fingers on the bail engage the rolls on the apron link and open the apron, at the same time closing the undercut gate at the upper end of the feeder, thus allowing the contents of the feeder to flow into the bucket. When the bucket rises, it closes the apron at the lower end and opens the gate at the upper end, allowing the feeder to refill. It thus insures a full bucket each trip and prevents spilling coal into the pits. The operation of this apparatus requires little power, the weight of the empty bucket being more than sufficient to open the apron and close the gate. The opening between the track hopper and feeder has an area of 24 in. x 46 in., which allows the coal to pass into the feeder rapidly and prevents choking or clogging at this point.

The bucket is made of heavy steel plate, with a rounded bottom, and is carried on trunnions attached at each end. It is held in an upright position by latches, which are automatically released at the top of the shaft, where the bucket tips and discharges its contents into the storage bin. The buckets are operated by a double-belted reversing worm-geared hoist, which has a bronze gear and steel worm, enclosed in a dust-proof casing. The steel worm running in a bath of oil insures proper lubrication at all times. The hoist is operated by belts from a



Locomotive Coaling Chute.

countershaft, which runs constantly in one direction and allows the use of either gasoline, steam or electric motive power. The hoist is equipped with a friction brake that sets automatically whenever the belt is shifted to the loose pulley. It also has a stop nut on the extended end of the worm shaft which engages a clutch that automatically shifts the belt to the loose pulley at either the top or the bottom of the shaft. This nut is adjustable, and the exact point at which the bucket stops at the top or bottom is easily controlled by adjusting this nut. This arrangement is a positive stop to the bucket, and when properly set, the point at which the bucket stops, either at the top or bottom, will not vary more than one inch. A safety device is also attached to the drum so that in case the cable gets crossed or slack for any reason, it trips a clutch and the hoist is stopped instantly, setting the brakes at the same time.

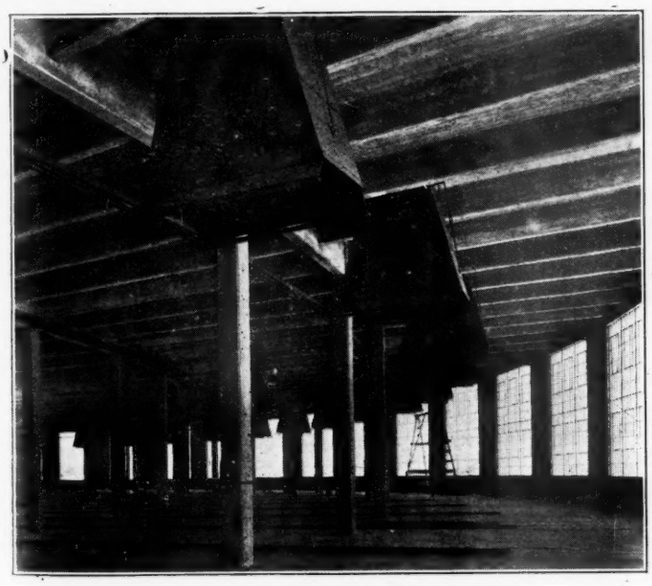
The plant is equipped with a belted car puller which enables the operator to easily move the cars either to or from the track hopper. The automatic starter used on these stations consists of an oscillating pipe capped at both ends and pivoted at the center. The pipe is partially filled with a non-freezing fluid and

a spherical iron ball is placed inside. It is placed underneath the hoist and connected to the belt shifter so that the pipe in oscillating or rocking moves the belt shifter in either direction. The bucket raises the end of the pipe where the ball is and starts the ball rolling to the other end. When the ball reaches the other end of the pipe, it depresses it so as to shift the belt and starts the hoist in the opposite direction. The length of time necesssary for the ball to travel from one end of the pipe to the other regulates the time that the bucket is stationary. This, however, may be varied by moving a button on the cable that operates the pipe so that the ball will travel more slowly and consequently allow more time for the filling and emptying of the bucket. The hoisting capacity of the plant is from 70 to 100 tons of coal per hour, depending on the size of the bucket used. Four sizes of buckets are provided, one and one-quarter, one and one-half and two tons' capacity.

A recording delivery chute for measuring and delivering coal from the storage bin to the engine tender is designed to take the place of scales. Any number of engines may take coal at a plant during the night, and the operator in the morning may open his box and find a correct record showing the number of engine and amount of coal taken by each one. A steel undercut gate and self-balancing delivery apron is used for conveying coal from storage bin to tender.

Smoke Jacks for Concrete Engine House.

Cast iron smoke jacks, installed in a concrete roundhouse, are shown in the accompanying illustration. They are substantial and durable and embody several new ideas. The hood is sufficiently long to permit ample movement of locomotives while undergoing light repairs. The sides of the hood are adjustable, which allows the flare to be increased when the locomotive stack is not directly under the hood. The ends are made with a steep pitch to prevent the steam and smoke choking in the upper part of the hood as it comes from the stack at a high velocity. To keep the roundhouse clear of smoke and steam while the locomotives are passing in or out, a ventilator is furnished around the pipe at the roof line. This idea has been found particularly valuable. To retain the heat in the roundhouse when the smoke jack is not in use a damper is furnished which is operated by a sliding weight or ball connected



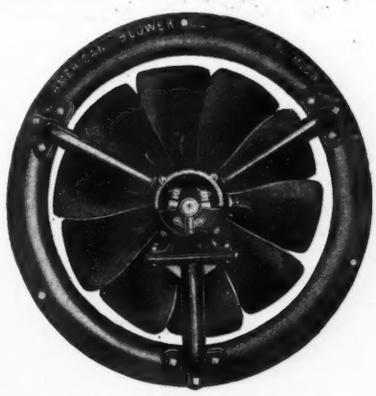
Concrete Roundhouse Equipped with Cast Iron Smoke Jacks.

to the damper, the ball holding the damper in an open or closed position. These smoke jacks were designed and are manufactured by Paul Dickinson, Incorporated, Chicago, Ill.

Railway construction is progressing rapidly in China and Manchuria. New lines are being built by the Chinese without foreign aid in any form. Other roads are built and operated almost entirely by foreigners, but financed by the Chinese. The first 30 miles of the Chinese section of the Kowloon-Canton Railway, China, from Canton to Tung Mei, was opened December 5. The construction of this section was begun in 1908, and is expected to be in operation by July 1, 1911. The bridging of the East river valley offers the greatest difficulty, but the construction is already under way. The length of the section will be 87 miles. The tidewater bridges at Hangchow and Pahkuam on the Hangchow-Ningpo Railway, China, are the most difficult features of construction on this line, but progress is reported. A large force is engaged in working from the Ningpo end toward Yu Yao, and the work of grading is progressing at either end of the line. Tiehling has been approved as the western terminus of the Heilung Chang Railway, Manchuria. Tiehling is near the Liao river, so the railway will have the advantage of water transportation. The alternative, Kaiyun, which is situated about 18 miles from Liao, was discarded because the line would have become a feeder for the South Manchurian Railway and would have diverted the traffic from Yinkou to Dairen.

Disc Ventilating Fan.

The American Blower Company, Detroit, Mich., has been developing a new curved blade disc fan during the past four years. It is called the Ventura, and has ten broad blades of the necessary curve to produce large volumes of air. It will discharge freely against pressures of from one to two inches, the central disc preventing any back flow of air when the fan is working against pressure. It runs at the speeds common to all disc fans and is so designed that its discharge flow seems to bend inward before



Ventura Ventilating Fan.

beginning to diffuse. This feature is peculiar to the Ventura fan, not being found in other fans of the disc type. A strong direct breeze is thus provided, which makes it valuable for ventilating purposes. The mechanical efficiency of these fans is uncommonly high, having been determined from many tests made by the makers to be 64 per cent.

Side Dump Car.

A two-way, double truck, air operated, side dump car, which is somewhat heavier than those now in general use, has recently been designed and put on the market by the Fitz-Hugh, Luther Co., of Chicago and New York. Its design is the result of several years' experience of an engineer in construction work. The details have been worked out with a view to securing the greatest strength of the materials used, and the parts have been designed with the idea of enabling contractors and other users to make repairs without shop facilities and with the most common hand tools. Though the car is of standard height for this type, it dumps to an angle of 49 deg., which facilitates its clearing of material. This is accomplished by having the pedestal and hinge castings of one piece each, and so arranged that when the load is dumped the center of support is changed to the dumping side. The car body is slightly lifted by the momentum of the load and is left poised so that it will right itself when the air is released. Journal boxes are placed inside the wheels to avoid injury, and where they will enable the car to clear the dumped material. This location also tends to keep the wheels on the rail while running over bad track.

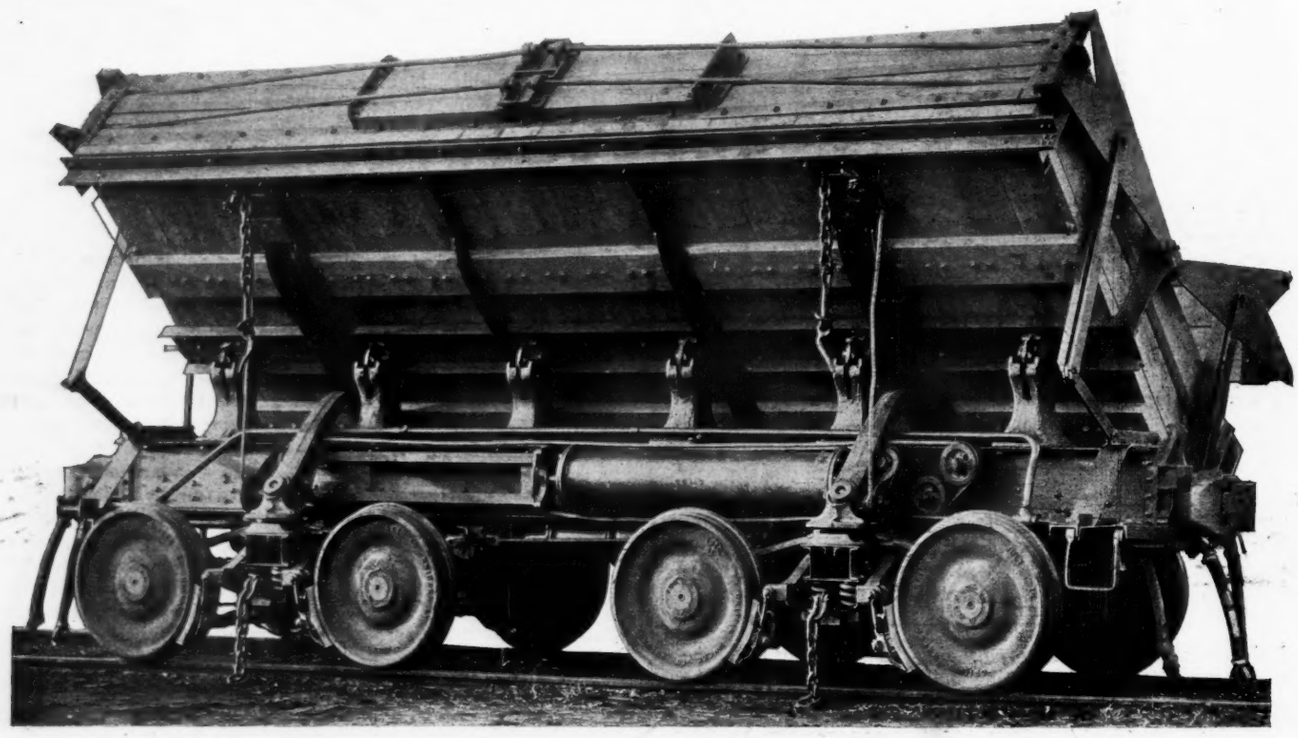
The cars are constructed in accordance with M. C. B. requirements as to wheels, axles, wedges, brasses, couplers, sill

steps and air brakes. The center sills are continuous from end to end, running through solid cast steel body bolsters. No rivets are put through the flanges of the sills where there are tension strains and like precaution has been exercised at other places. The one-piece body bolster of steel has cast integral with it two center plates, two side bearings and two spring pockets which contain coil springs arranged to take the shock of the body as it dumps to discharge its load.

As in other cars of this type, chains are used to hold the body in a horizontal position while traveling. Instead of fastening one end of the chain to the non-elastic car body, and the other to a rigid truck bolster, the chains on this car are anchored below the truck springs, so that as the chains on one side receive sudden strains they are relieved by the cushion effect of the spring, avoiding breakage and delays. Doors on this class of car are frequently broken by boulders striking them just as the car starts to dump. On this car the door is designed to distribute the strains throughout its length, and is made of planks set into the steel end door casting. A steel tee as long as the door is placed between the edges of the planks and is engaged by the steel end castings and a center bracket. To still further stiffen the door a batten section is placed along the center third of the door and the whole is bound together by truss rods running through the steel end castings and terminating at a steel bracket in the middle of the door. Each truss rod is straight with an upset end and is tightened by screwing up a common right hand threaded nut either at the door end or at the center bracket, the use of left-hand threads being avoided entirely.

All chain fastenings, door and dumping iron pins are loose and straight, and are held in place by cotter pins at each end, thus permitting their removal in either direction. Care has been taken to protect all hose connections, brake apparatus and coupling appliances from breakage by falling material by either placing them under the car body or by shielding them with steel forged guards.

Two-Way Side Dump Car Operated by Compressed Air.



Two-Way Side Dump Car; Dumping Position.